

***PROCEEDINGS OF THE 9TH  
INTERNATIONAL CONFERENCE ON  
INNOVATION AND MANAGEMENT***

**November 14-16, 2012**

Eindhoven, The Netherlands

**Chief Editors**

*Geert Duysters, Arnaldo de Hoyos, Ken Kaminishi*

**Associate Editors**

*Deng Mingran, Ye Jianmu*

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### 【Summary】

The proceedings include operation innovation and its applications, university-industry collaboration, strategic alliance, open innovation and distributed innovation, environmental innovation and sustainable development, product, industrial and regional innovation, organizational, institutional and management innovation, S&T policy, intellectual property and knowledge management, and miscellaneous.

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# Association Rules Between Driver Behavior and Auto Parts Maintenance Based on Active Service\*

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**Abstract:** Although car users are making more and more complaints, there are still many issues which can be avoided through active service by service providers in advance. We can get many customers' characteristics, such as driving proficiency, driving habits, road conditions and so on from customer's raw materials. All these features will affect the probability of auto fault. In this paper, we take driving habits for example. Firstly, we analyze the association between driving habits and motor vehicle parts, and then discover the comprehensive factor for a group of customers. Finally, we can identify the best time of the required services for every motor vehicle parts.

**Keywords:** Active service; Association rules; Behavior prediction; Driving habits

## 1 Introduction

In recent years, the capacity of auto manufacturers to reduce costs in the manufacturing sector has been fully tap, and the profitability of the enterprise profit margin is decreasing. In this context, the entire automobile market began to focus on the development of after-sales service which is a new profit growth point. The traditional service model is a passive-type services, namely, "find fault - problem diagnosis - solution." This service model can not meet the expectations of customer, as a result, service providers should predict the characteristics of maintenance services, and provide customers with active service based on user behavior characteristics and vehicle attributes.

In their study, Federico Mancosu<sup>[1]</sup> gave his idea about how to improve vehicle active safety by modified on tyre, vehicle and road design characteristics. Isamil Dagi<sup>[2]</sup> developed a dynamic planner and investigate situation pattern for appropriate goal deduction. Their works give us a wonderful inspiration when we try to find the method about how to evaluate the behavior of driver. An amusing test item related to customer behavior which be included of the test paper of competition of modeling creation hold in China<sup>[3]</sup> also inspire us for our research on the customer behavior prediction.

According to theory of vehicle maintenance, the occurrence of vehicle component failure follows certain rules and can be described, the failure curve is similar to "bath panel" shape. Car trouble can be divided into early failure period, occasional failure period and failure of depletion period. The early failure period and failure of depletion period obey normal distribution or Weibull distribution, while occasional failure period obeys exponential distribution. However, there are a wide variety of auto parts, not all parts are strictly adhered to these three periods, and some parts may have only one or two stages. Yu Jiang<sup>[4]</sup> studied the availability of vehicles through four factors of the weather conditions, maintenance conditions, road conditions, and establish a availability simulation model to determine the best operating temperature and maintenance mileage, so as to provide support for auto repair services.

## 2 Collection of Customer Raw Data

Car after-sale service business has accumulated a lot of data and information about customers, such as mileage records, customer basic information, amendment record, maintenance manuals, customer feedback and suggestions, customer survey information. These data are directly accessible, while customers' features are obtained indirectly through raw data.

There are two kinds of characteristics for customer groups: one is using behavior characteristics. Because customers have a lot of using behavioral characteristics, we only consider to find out the most crucial factors, such as driving proficiency, driving habits, etc. The other features are about customer cars and driving environment related, such as mileage projections, parts' life expectancy and road conditions.

As figure 1 showed, there are six kinds of raw data which can be directly obtained on the left, while five kinds of characteristics are listed on the right. The details of the five characteristics are as follows:

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1) Mileage projections. Based on past mileage documented data, we can get mileage equation by regression analysis:  $\text{mileage} = b + r \times \text{Time}$ , we can predict customers' daily driving mileage during the next period of time.

2) Road conditions. Road conditions have a great influence on the performance of cars. Suppose two cars are identical. Let them run on two different condition roads. After a period of time, the performance and probability of failure of two cars are certainly not the same. It can be judged by customer basic information and survey data.

3) Proficiency. Suppose a novice driver and an experienced driver drive two identical cars, the damage probability of the former is larger than that of the latter. We can judge a customer's proficiency by repair records, customer basic information and customer survey data.

4) Driving habits. Driver's driving habits are different. For a particular brand of car, they have the same parts, follow the uniform quality control standards, and are produced at the same production line according to a strict assembly process. Therefore the performance index for each engine is almost the same. However, the life of each engine is different. Some run 50 million km with no major repairs, while others run less than 10 million km, with the engine channeling smoke and burning oil. Each owner's driving habits, proper use and maintenance of vehicles are the key. These factors will determine the engine's overhaul mileage .

5) Components' life expectancy. Customers will get a car maintenance guide when they buy a new car. However it is made in accordance with the standard driver, and don't apply to all customers. We can modify the maintenance guide by amendment records and customer feedback.

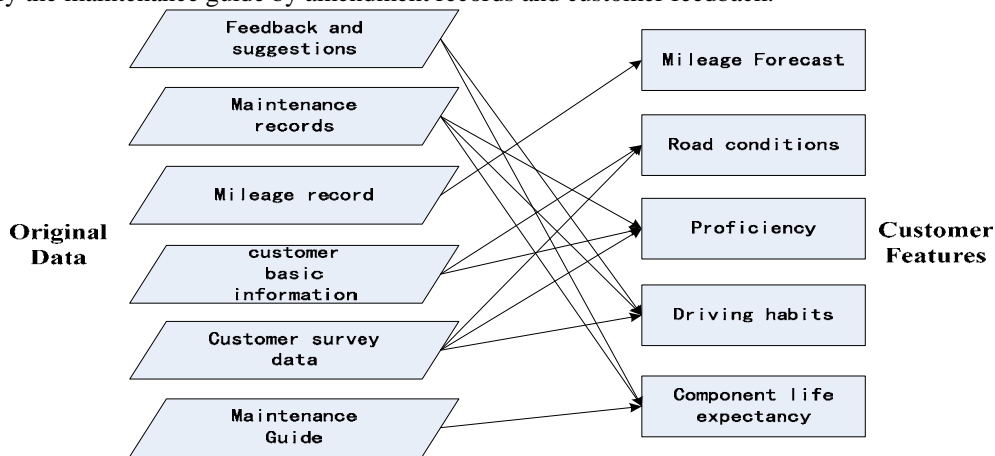


Figure 1 Customer Original Data and Features

### 3 Association between Driving Habits and Motor Vehicle Parts

Customer features, such as road traffic conditions, driving habits and driving proficiency, affect the probability of failure. In this paper, we take driving habits for example, analyze the association between driving habits and motor vehicle parts. and then find out the best service time for each motor vehicle parts.

According to statistics, vehicle maintenance focus on the following eight components<sup>[5]</sup>.1)Engine: the difficult start, reaching less than nominal power indicator of manufacturers, abnormal fuel consumption, abnormal sound, idling exceptions and other issues.2)Clutch: the separation is not complete, skidding, body trembling, abnormal sound and other issues.3)Transmission: the shifting difficulties, abnormal sound, jump stop, chaotic block, fever and other issues.4)The front and rear axles and suspension system: whether the axle, drive shaft, suspension have abnormal noise, or shock-absorber spills oil and other issues.5)Braking system: drag slip, abnormal sound, deviation and so on.6)Steering system: the body jitter, deviation, abnormal sound and so on.7)Tire: early wear and tear, burst, early cracking and so on.8)Body and electrical accessories: body rust and cracks, the refrigeration and heating of air conditioning is abnormal, lifts don't work properly, the quality of seats, interior noise, body vibration. Starter, generator and electric wipers, lighting, turn signals, instrument cluster does not work.

We summarize 14 bad driving habits about automotive customers they are harmful to certain auto parts. (Table 1)

- 1) High speed. No matter which block a car is in, the speed of engine should not exceed 70% of the maximum speed. High speed running for a long time are not allowed.
- 2) Overload running. Overloaded vehicles are prohibited. Once the engine does not work smoothly, they should be immediately changed into a low gear.
- 3) Tire rub step. The tire side is the thinnest. Special attention should be paid to protect the side of tire when across the stairs or road sub-teeth.
- 4) Emergency brake. Tests show that emergency brake at medium speed on a normal road, will make tire tread wear up to 0.91mm-1.20mm, as well as the wear of driving 3000km.
- 5) Clutch pedal. Clutch will be in the semi-separation with the left foot on the clutch pedal when driving, which will not only affect the power output form engine to transmission, but also cause clutch early abrasion.
- 6) Cold start. Good driving habits should firstly preheat the car before start it, unstill the engine coolant reach normal operating temperature (above the minimum 50 °C).
- 7) High gear driving. When a car encounters resistance, and its speed decreases, you should quickly change the gear into a low-level one. High gear driving will cause engine's temperature increasing, power coastdown, fuel consumption, engine wear boosting, and sometimes cause the engine flameout or produce deflagration.
- 8) Shift while clutch isn't complete separate. If the owner shift while clutch isn't complete separate, it will be a fatal injury to the manual transmission.
- 9) Hand brake driving. The best way of controlling travelling speed is changing gear rather than using brake. Driving with hand brake will damage the brake pads badly.
- 10) Turn the steering wheel all the way. Turn the steering wheel all the way will break the power steering system.
- 11) Cross the road sub-teeth. Shock absorbers, springs and suspension components are all vulnerable auto parts. Before cross groove, we should slow down the speed earlier, rather than abruptly cross it, which not only ensure the comfort, but also protect the shock absorbers, springs and suspension.
- 12) Frequently combined switch. Frequently combined switch will increase the risk of damage.
- 13) Force the water spout work. When the water spout was frozen in winter, forcing the water spout work will break the water pump. We should start the car ,and wait until the vehicle temperature is up, and the ice in the water spout is frozen .
- 14) Hold on the window regulator. Many vehicle glass electric switch does not work or can not lift the window glass in place because of the wrong daily operations. When we use the electric window regulator to lift the glass, we must let go in time before the window go down to the end, or rise to the top, otherwise the motor will be damaged.

**Table 1 Driving Habits and Susceptible Auto Parts**

Driving habits	Susceptible Auto Parts	Driving habits	Susceptible Auto Parts
High speed	Engine	shift while clutch isn't complete separate	Transmission
Overload running	Engine	Hand brake driving	Brake System
Tire rub step	Engine, tires	turn the steering wheel all the way	Steering System
Emergency brake	Tires	Cross The road sub-teeth	Body Accessories
Clutch pedal	Clutch, brake system	Frequently for the combined switch	Body Accessories
Cold start	Engine	Force the water spout work	Body Accessories
high gear Driving	Engine	hold on the window regulator	Body Accessories

#### 4 Calculation of Customers Comprehensive Factor

Generally speaking, vehicle maintenance business has thousands of customers. So, customer clustering is essential, That is, divide the customer into a number of groups to manage respectively. Though the best way to get customers' driving habits is questionnaire, it is not realistic for such investigations. We can select a certain percentage of customers to carry out the investigation, assuming that the driving habits from the same customer base are similar. This article assumes that there are 14 driving habits to influence the eight components, For different customers, their driving habits' impact on the same auto parts is not the same. Therefore, each driver has a comprehensive factor to each component.

Suppose there is a customer group with m customers, so that I (i = 1,2, ..., 8), j (j=1,2, ...,14), k(k=1,2,...,m) represent automotive parts, driving habits and customers respectively. The calculation steps of customer comprehension factor CFi are as follows <sup>[6]</sup>:

(1) For all parts, the weight of part  $i$  under the factor  $j$  ( $W_{ij}$ ) was given by experts and saved in the Table Weights.(Table 2)

**Table 2 Weights Table**

Auto Parts	Driving habits				
	$h_1$	$h_2$	...	$h_i$	...
$P_1$	$w_{11}$	$w_{12}$	...	$w_{1i}$	...
$P_2$	$w_{21}$	$w_{22}$	...	$w_{2i}$	...
...	...	...	...	...	...
$P_i$	$w_{i1}$	$w_{i2}$	...	$w_{ij}$	...
...	...	...	...	...	...

(2) by experts or given parts auto parts manufacturer  $i$  Standard Life  $S_i$  (Measured in miles, not time), and parts  $i$  Standard scores  $P_{ij}$ . So you can be part  $i$  Weighted scores  $\sum_{j=1}^{14} P_{ij} w_{ij}$ .

(3) Select a certain percentage of customers ( $n$  customers) from a customer group. We get customer's driving behaviour  $C_{kj}$  though customer's investigation. And then we can find the customer's every part's score  $\sum_{j=1}^{14} (\frac{1}{n} \sum_{k=1}^n C_{kj}) w_{ij}$ .

(4) By the score of customer's score and the standard score of part  $i$ , we can easily get the customers' comprehensive factor  $CF_i$ :

$$CF_i = \frac{\sum_{j=1}^{14} (\frac{1}{n} \sum_{k=1}^n C_{kj}) w_{ij}}{\sum_{j=1}^{14} P_{ij} w_{ij}} \quad (k = 1, 2, \dots, n) \tag{1}$$

(5) Finally, we propose the following approach to predict the conditions for services:

$$L_i = CF_i \times S_i \quad (i = 1, 2, \dots, 8) \tag{2}$$

For each customer of the customer group, auto parts  $i$ 's most possible life is  $L_i$ .

### 5 Service Remind Model

The active service system of automotive services provider is showed in figure 2. It follows B/S structure, so as to facilitate customers to log in at home and view related information. The main process of the system include: collection of the original data, data transmission, data analysis and service releases. The original data, including the driver behavioral data and vehicle status attribute data, is gained from the user interface subsystem and vehicle traveling recorder<sup>[7]</sup>. User interface subsystem helps user interact with the system, and update the system's user information continuously. Data can be transmitted through the Internet.

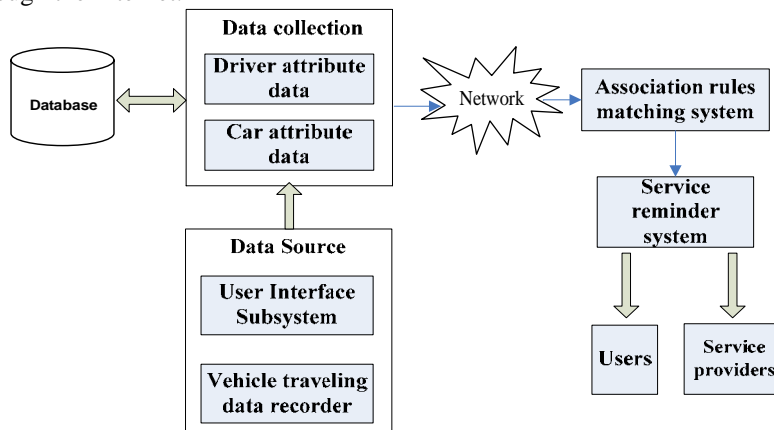


Figure 2 The Framework Map of Active Service System

The main functions of service remind system are to remind customers the best service time. First of all we should determine  $L_i$ ,  $r$  and  $t_i$ .  $L_i$  refers to the life expectancy of auto parts  $i$ .  $r$  refers to customers' daily mileage (km/day);  $t_i$  refers to the date that a customer's auto part  $i$  was checked or replaced last

time. Then customers' best service date is as follows:  $T_i = \frac{L_i}{r} + t_i$ .  $T_i$  refers to the next most likely date that component  $i$  will be checked or replaced, and  $\frac{L_i}{r}$  is the life of part  $i$ .

## 6 Conclusion

When customers use products, their using behavior has a direct impact on the product's performance. Through the analysis of customers' behavior, we can forecast the product's required service content and time, and enhance business's service quality and response level, changing passive service into active service. Therefore, we can improve customer's satisfaction with the use of the product, and avoid the waste of resources because of invalid business service<sup>[8]</sup>. There is already a lot of research on customer clustering. This paper aims to extract the common features of customers, and then convert customers' common features into knowledge. In the future, we will study the differences between customer groups, as well as the differences between individuals within a group, and how these differences impact on customer's service, thus we can provide more sophisticated services for customers.

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# Members' Behavior and Decision-Making Coordination Model in Complex Supply Chains Based on Risk Monitoring

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**Abstract:** As customer demand and sustainable development are paid more and more attention, it is reasonable and important to enhance supply chains' reliability and stability through supply chain coordinating by efficiently monitoring and controlling members' behaviors and decision-makings. The principle and process of supply chain members' behavior and decision-making coordination based on risk monitoring are analyzed, the quantitative risk monitoring indicators are designed, and the member's behavior and decision-making coordination model is proposed.

**Key words:** Supply chain management; Coordination; Risk modeling; Behavior and decision-making

## 1 Introduction

Supply chain is combined of members tie together by business processes, so it is in fact a self-adaptive complex system. As supply chains getting more complex, it is getting more and more difficult to maintain their structural reliability and operational stability. A subtle fluctuation on logistics or information flows usually causes reactive adjusts of some members, and then leads to the turbulence of the whole supply chain, initiating supply chain risks: the information asymmetry among members decreases the reasonability and reliability of their behaviors and decisions, and produces aftereffects which are difficult to eliminate; the inherent risks of single members will break through enterprise boundaries and interact with other members', leading to unpredictable effects; and the members operating in multiple supply chains make "cross infection" of risks among different supply chains more possible. Therefore, as customer demand and sustainable development are paid more and more attention, it is reasonable and important to enhance supply chains' reliability and stability through supply chain coordinating by efficiently monitoring and controlling members' behaviors and decision-makings.

Nowadays researches on supply chain coordination focus on 3 aspects: i) information coordination aiming to integrate, share, and optimize information flow among supply chain members; ii) benefit coordination emphasizing on business interaction and resource optimizing within the supply chain system; and iii) behavior and decision-making coordination considering the total competences and operation stability, and emphasizing on uncertainties and dynamic interferences of members' decision-makings.

Information coordination is tightly associated with researches on supply chain modeling, and has gotten numerous achievements, providing technological supports to supply chain practices. Benefit coordination in supply chains has also accumulated a great deal of literatures, and guided supply chain practice to great extent. However, researches in this aspect take benefit and resource allocation as the final goal, emphasizing on the self-compliance of coordination mechanisms. The uncertainty and deviation in mechanism execution are ignored. These researches focus more on such static constraints as production/inventory capabilities and costs/prices, taking key independent variables, such as the environment, process and interferences of members' behaviors, as transparent (or important). As the result, research findings are usually theoretical static coordination, and hard to be applied to practical supply chains which need dynamic coordination mechanisms.

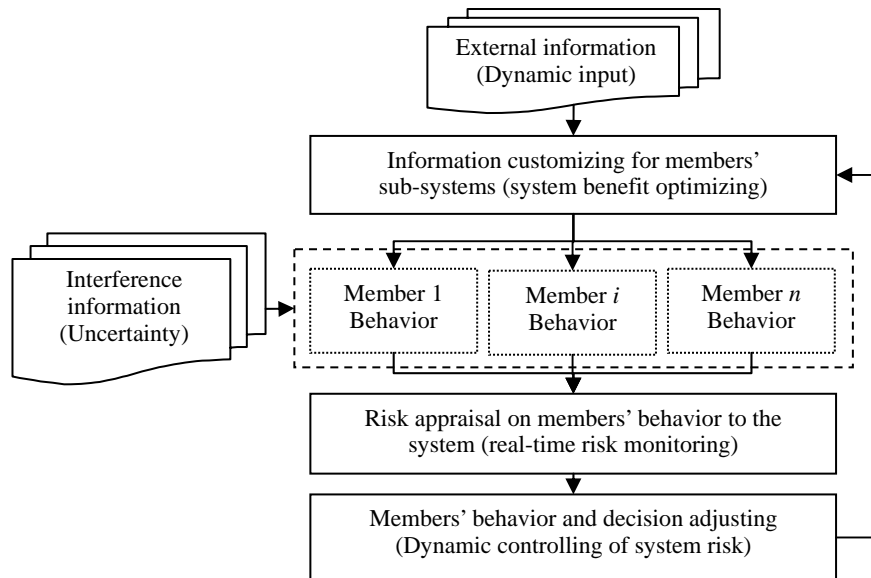
In this paper we propose a coordination framework of supply chain based on members' behavior and decision-making risk monitoring. Firstly, the basic principle and process of members' behavior coordination will be analyzed, and then the risk monitoring model to members' behavior and decision-making is established. The coordination model of members' behavior based on risk monitoring is proposed. Finally, the probable direction of future work is discussed.

## 2 The Principle of Behavior and Decision-Making Coordination among Supply Chain Members

From the aspect of system controlling, the essence of supply chains operation is to transform system inputs (information and resources) into system outputs (production and /or services), through

members' specific behaviors. The coordination mechanism of supply chain is to ensure all elements of the system act timely and exactly, maintaining the system operates stable and effectively. In this means, supply chain coordination is to decompose the system inputs into specific signals to relative members, and stimulate their specific behaviors, so as to get the expected system output.

The coordination process of supply chain members' behavior and decision-making includes 4 basic stages, as described in Figure 1.



**Figure 1 The Process of Members' Behavior and Decision-Making Coordination**

Firstly, the supply chain system receives the inputs (i.e., market demands, customer orders, information of competitors, environment variables, etc.). Taking into account the information like system structure and members' characters, the system-level optimization will be found, the overall benefit maximizing as the core aim. The optimal solution will be mapped as input signals of members' sub-systems, and members are then expected to act upon these "optimal" ways. However, as all members are self-beneficial, and there exists so many uncertainties in their behavior environments, nearly all members will deviate their expected "optimal" ways in their actual works, resulting in unpredictable impacts to the system operation (which we call it Risks). Therefore, there needs a important process to form a close-loop feedback mechanism which traces members' behavior and decision-making, recognizes and appraises their possible risks, optimizes and adjusts members' behavior and decision space, and finally coordinates the whole supply chain system.

### 3 Modeling the System Risk of Members' Behavior and Decision-Making

To coordinate supply chain members' behaviors and decision-makings, we must effectively describe the structure and character of members' behaviors and decision-makings, and correctly analyze the interact mechanism of this structure and character to supply chain systems. It is necessary to establish an indicator system to monitor members' behavior risks to the supply chain.

#### 3.1 Risk elements of members' behavior and decision-making

There are many elements which deter supply chain coordination. They can be classified into two categories. The first is object elements, which is intrinsic to the supply chain system, such as system structure, members' capabilities and risk preferences. Their influences on supply chain operation are relatively stable, and can be decreased but can not be eliminated. The other is the subject elements, which come from members' subjective initiatives. Because of members' different behavior abilities and decision rationalities, these elements have apparent contingency and randomness, and can have great impact to supply chain system stability. Members' individual behaviors may course behavior deviations of other members, even the system failure resulting from the resonance of members' behaviors. The famous Bullwhip Effect is just one of such example.

In supply chains, a lot of member behavior variables can effect the system operation, typical ones are order/supply quantity, production quality, order/supply price, delivery time, and so on. Suppose there



are  $m$  members in a supply chain. For convenience, it is reasonable to suppose that there are  $n$  similar behavior and decision variables for all members, denoted as  $X_i = \{x_{i1}, x_{i2}, \dots, x_{ij}, \dots, x_{in}\}$ ,  $i = 1, 2, \dots, m$ . Here,  $x_{ij}$  means the  $j$ th behavior variable of member  $i$ , and its feasible domain is related to the intrinsic character of the behavior.

### 3.2 The indicator system for members' behavior risk monitoring

In supply chains, members' behavior or decision changes usually lead to fluctuation of the whole supply chain's expected profit,  $\Phi$ , which is the function of all members' behavior and decision combinations, and can be denoted as  $\Phi(X)$ . The partial elasticity of  $\Phi$  to member  $i$ 's behavior or decision

$x_{ij}$ ,  $E_{x_{ij}}^{(1)} = -\frac{x_{ij}}{\Phi} \cdot \frac{\partial \Phi}{\partial x_{ij}}$ ,  $i = 1, 2, \dots, m; j = 1, 2, \dots, n$ , describes how  $\Phi$  changes when  $x_{ij}$  changes but other

members' behaviors and decisions keep unchanged. So it can act as an important indicator which shows the impact of members' behaviors to the supply chain system.

At the mean time, there are also interrelations among different members' behaviors. Or, behavior change of one member will raise behavior changes or decision adjustments of other (several or all) members, leading to the further change of the system's profit expectation. Denote the interference mechanism among member behaviors as  $X_k = X_k(X_i)$ ,  $i, k = 1, 2, \dots, m; i \neq k$ , then the impact of behavior change of one member to the system profit through other members' behavior adjustments can be roughly

described by another indicator,  $E_{x_{ij}}^{(2)} = -\frac{x_{ij}}{\Phi} \cdot \sum_{r=1}^m \sum_{l=1}^n \left( \frac{\partial \Phi}{\partial x_{rl}} \cdot \frac{\partial x_{rl}}{\partial x_{ij}} \right)$ ,  $i=1, 2, \dots, m; j=1, 2, \dots, n$ .

Changes of members' behaviors and decisions can also change the equilibrium of benefit allocation in the system. Denote members' benefits (or utilities) as  $\varphi_k(X)$ ,  $k = 1, 2, \dots, m$ , then, similar to those

discussed above, indicators  $e_{x_{ij}}^{(1)}|_k = -\frac{x_{ij}}{\varphi_k} \cdot \frac{\partial \varphi_k}{\partial x_{ij}}$  and  $e_{x_{ij}}^{(2)}|_k = -\frac{x_{ij}}{\varphi_k} \cdot \sum_{r=1}^m \sum_{l=1}^n \left( \frac{\partial \varphi_k}{\partial x_{rl}} \cdot \frac{\partial x_{rl}}{\partial x_{ij}} \right)$ ,  $k = 1, 2, \dots, m;$

$k \neq i$  approximately describe how the change of member  $i$ 's behavior  $j$  directly and indirectly affects member  $k$ 's benefit (or utility), respectively.

If members' behaviors or decisions fluctuate, i.e.,  $\Delta x_{ij}$ , its direct and indirect impact on the system's profit can be calculated through indicators proposed above, i.e.,  $\Delta \Phi^{(1)} = \frac{\Phi(X^0)}{x_{ij}^0} \Delta x_{ij} \cdot E_{x_{ij}}^{(1)}|_{X=X^0}$

and  $\Delta \Phi^{(2)} = \frac{\Phi(X^0)}{x_{ij}^0} \Delta x_{ij} \cdot E_{x_{ij}}^{(2)}|_{X=X^0}$ . Here,  $X^0$  and  $x_{ij}^0$  are present status of member  $i$ 's behavior or

decision, respectively. Similarly, we can also calculate the changes of other members' benefits (or utilities)  $\Delta \varphi_k^{(1)}$  and  $\Delta \varphi_k^{(2)}$ ,  $k = 1, 2, \dots, m; k \neq i$ , aroused by  $\Delta x_{ij}$ . If the profit change of the system exceeds the preset threshold value  $D$ , or there are deterioration of other members' benefits (or utilities), then the event  $\Delta x_{ij}$  is a risk event, and the risk warning should be taking and the coordination mechanism should be initiated.

## 4 Member Behavior and Decision-Making Coordination Model

Suppose the supply chain is in stable operation, and the system benefit allocation reaches acceptable (or Pareto) equilibrium. Once risk the event happens, i.e.,  $\{\Delta x_{ij} | \Delta \Phi^{(1)} \notin D \cup \Delta \Phi^{(2)} \notin D \cup \Delta \varphi_k^{(1)} < 0 \cup \Delta \varphi_k^{(2)} < 0; i, k = 1, 2, \dots, m; j = 1, 2, \dots, n\}$ , the coordination mechanism will be initiated ensuring members' behaviors combination automatically result in another acceptable equilibrium.

Denote present combination of members' behaviors as  $X^0 = \{X_i^0, X_{-i}^0\}$ , with  $X_{-i}$  meaning the behavior combination of members' other than  $i$ . the system profit is  $\Phi_0 = \Phi(X^0)$ , and members' benefits (or utilities) are  $\varphi_k(X^0)$ ,  $k = 1, 2, \dots, m$ , respectively. When the risk event happens, members adjust their behaviors to  $X^1 = \{X_i^1, X_{-i}^1\}$ , and the expected system profit changes to  $\Phi^{(1)}(X_i^1, X_{-i}^1)$  and  $\Phi^{(2)}(X_i^1, X_{-i}^1)$ , directly and indirectly. At the mean time, members' expected benefits (or utilities) change to  $\varphi_k^{(1)}(X_i^1, X_{-i}^1)$  and  $\varphi_k^{(2)}(X_i^1, X_{-i}^1)$ ,  $k = 1, 2, \dots, m$ , directly and indirectly.

The objective of the coordination mechanism is to dynamically adjust the feasible value domain of vector  $X^1$  according to  $\Delta x_{ij}$ , and then regulate members' behaviors and decision-makings. This is in fact to resolve a multi-person dynamic game, which can be described as the following programming:

$$\text{Max } \Phi(X_i^1, X_{-i}^1) \quad (1)$$

$$\begin{aligned}
s.t. \quad & \Phi^{(1)}(X_i^1, X_i^0) \geq \Phi_0 \\
& \Phi^{(2)}(X_i^1, X_i^{-1}) \geq \Phi_0 \\
& \varphi_k^{(1)}(X_i^1, X_i^0) \geq \varphi_k(X^0), k = 1, 2, \dots, m \\
& \varphi_k^{(2)}(X_i^1, X_i^{-1}) \geq \varphi_k(X^0), k = 1, 2, \dots, m \\
& X_i^1, X_i^{-1} \text{ obey their basic constraints respectively.}
\end{aligned}$$

It is a relatively complex nonlinear programming with a large amount of constraint variables, and can be transformed into a combinatorial optimization problem, which can be solved using heuristic methods. However, the main task of the coordination mechanism is not to find the optimal solution  $X^{1*}$ , but the satisfactory one. A rough feasible solution is enough to regulate the members' behaviors, with shorter solving time, which is vital to realize the real-time coordination.

## 5 Conclusions

Coordination of members' behaviors and decision-makings is necessary to stable operation of supply chains. The principle and process of member's behavior coordination based on risk monitoring are analyzed, the risk monitoring indicators of member behaviors are designed, and the member behavior and decision-making coordination mechanism is established.

Given a specific supply chain, the risk monitoring system and coordination frame can be realized by establishing indicators such as  $E_{x_{ij}}^{(1)}, E_{x_{ij}}^{(2)}, e_{x_{ij}}^{(1)}|_k$  and  $e_{x_{ij}}^{(2)}|_k, i, k = 1, 2, \dots, m; j = 1, 2, \dots, n$ , and the system coordination can be achieved by quickly resolving the model (1) described above.

To make the coordination model practical, the following work should be taken out thereafter:

(1) Describing the behavior structure and decision modes of supply chain members. Member behavior and decision-making are abstract concepts, and a specific behavior usually results from the combination of a lot of basic behavior elements. Only if we can trace these basic elements accurately can we coordinate members' behaviors ultimately.

(2) Finding the interference mechanism among members' behaviors and decision-makings. 3 problems are to be solved here: ①the linkage between system profit and members' behavior and decision-makings,  $\Phi(X)$ ; ②the relationship between members' benefits and members' behavior combinations,  $\varphi_i(X), i=1, 2, \dots, m$ ; ③interferences among members' behaviors and decision-makings,  $X_k \leftarrow X_i, i, k=1, 2, \dots, m; k \neq i$ . A reasonable way to solving these problems is supply chain risk simulating.

(3) Fast-solving the member behavior coordination programming. In supply chain operations, quick response is vital to the coordination mechanism to realize real-time monitoring and dynamic adjusting of members' behaviors and decision-makings. Therefore, it is necessary to refine the coordination programming by specifying members' behavior characters, optimizing the solving algorithms, and solidifying it into the behavior risk simulation systems.

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# A Study on Factors Influencing User Participation Behavior in Mobile Community

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**Abstract:** With the rapid development of mobile networks, mobile communities have gradually become popular, and user participation is the key factor on mobile community development. This paper analyzes the behavior of mobile users to participate in community, and establish a model of factors affecting it. Taking users of mobile community as the survey, a total of 278 valid questionnaires were collected. Perceived usefulness and quality of the mobile community not only directly affect positively mobile community trust, but also indirectly influenced positively participation behavior in mobile community. Perceived costs and perceived risk not only directly affect negatively mobile community trust, but also indirectly influenced negatively participation behavior in mobile community. Finally, the paper argues the application inspiration of the model.

**Key words:** Mobile community; TAM; Mobile community quality; User participation

## 1 Introduction

Mobile community is an important application of mobile commerce, and is being gradually spread in China. According to the report of CNNIC, there are 318 million of Internet users by phones by the end of June 2011, increased over 14.94 million than 2010. Internet users by phones account for 56.5% in all internet users. Mobile community is a users group in mobile Internet, and users can enjoy all applications just like virtual community in Internet. Compared to traditional wired Internet, the biggest advantage of mobile Internet is its universal connectivity, also known as ubiquitous in nature, that is, the portability of mobile terminal devices. Users can connect to mobile networks by mobile terminals at any place and any time, breaking the constraints of time and space and greatly improving the efficiency of communication. So the user can access to the mobile community at any time and any place.

Another advantage of mobile Internet is the combination of location information, and mobile Internet can capture location information of the users, according to this feature we can develop a lot of different functions from the Internet virtual community services. For example, tourists take pictures and upload to mobile community, so other users can get the source of the pictures, which increases the vividness of this service.

The user proportion of mobile community site is 41.1% at first half of 2011, which is much lower than mobile instant message, mobile news and mobile search. The investigation of international consulting firm Frost&Sullivan revealed a large number of users of Facebook and Twitter from mobile networks, and Mixi Website has more users of mobile networks than wired networks. Renren, Kaixin and Tianya Website have also a mobile access, but with a small scale of users. Compared to the mobile community applications of foreign, domestic mobile community of users is also a very small proportion. So we need to study the factors influencing user's participation behavior in mobile community, and to increase the scale of users of mobile community.

## 2 Literature Review

Attracting the user's participation is the key to the rapid development of mobile communities. At present there are much more research on Internet virtual community than on mobile communities. About mobile communities study some scholars refer to approach about Internet virtual communities' research. Siau and Shen explore the factors influencing the mobile business customer trust. They think that trust in mobile business can be divided into initial trust and continuous trust, and the factors affecting initial trust in mobile business are perceived technology feasibility, familiar, reputation, information quality, third-party certification and attractive incentives. Han et al found that trust and recognition are adjustment factors which social demand

and self-expression affect the motivation for participation in virtual communities. Because the users use mobile business services at the first time, the users do not use the experience to follow, trust propensity, mobile business reputation, the perception of the characteristics of mobile commerce site, and the familiarity of the mobile services affect jointly the company's initial consumer trust.

Lin studied personal value and trust theory in mobile business, he found if the users are not satisfied with system and customer value, they would not continue to use mobile business services, and trust play an important role in use behavior of continuous mobile business service. Hsu found that perceived usefulness significantly affect the user preferences, and thus affect the online gaming community on loyalty. Zhang believes that mobile community services have the following five features: mobile services, user-friendly interface and easy operation, privacy protection, effective search engine and user-friendly community management, improved the profit model, these features will attract mobile users to participate in community. When the customers use mobile community services, in addition to making benefits, they also need to pay certain costs and take some risks, including the perception of cost, security and privacy risk of leakage. Cost is one of the factors that the customers need to consider. The users can compare to the cost of using Internet, and get the perception of cost of mobile business. In comparison, the perceived cost is visible, but the risk is invisible. Mobile community bases on wireless network, compared to wired networks, and are easier to leak information, be intercepted and destructed. So there exists a greater risk.

### 3 Research Model

There are many factors affecting user participation behavior in mobile community, so how to build a model to evaluate these factors is very important. The existing study is to investigate the behavior of Internet virtual communities, a relatively rarely involved in small mobile community. Extend these studies to the mobile community applications, the paper moves to build a user community of the factors involved in the model, and through empirical analysis found a significant impact on the mobile community user behavior factors. Model assumes that there are four factors, including perceived usefulness, perceived cost, perceived risk and the quality of the community jointly decided to move the mobile user community's trust. Antecedent of trust by the trust variables affect the behavior of users in the mobile community. Mobile users will directly affect the community's trust in mobile community user behavior, while perceived usefulness and quality of the mobile community is also considered a direct impact on the behavior of users to participate in the mobile community.

Previous studies have shown that perceived usefulness of technology affect consumer attitudes, and affect new technology adoption and usage behavior. Davis proposed a technology acceptance model which is popular, and perceived usefulness is a main factor in the technology acceptance model, and usefulness indicates that users can improve its performance because of using new technology. When studying the impact of trust on online shopping, many researchers introduce the technology acceptance model, and examine the relationship between trust and technology acceptance model, and confirm empirically that trust and perceived usefulness have a significant impact on motivation of online shopping. Lin argue that trust affect significantly usage intention of mobile stock. Kim examine the relationship between motivation and trust on mobile banking, and confirm empirically that relative benefits and initial trust of mobile banking have a significant impact on usage intention of mobile banking. Extending the discussion to the context of mobile community, we posit that:

H1: Perceived usefulness positively affect user behavior of participation in mobile community.

H2: Perceived usefulness positively affect user trust to mobile community.

Previous studies argue that the cost is the negative cost of users. Consumers use mobile community services, they will have to pay a certain amount of money, time, energy and stamina. If the users think mobile social community is useful for their own, his perception of the acceptability of the cost will be high, and it will affect his sense of trust in mobile community. We can make assumptions:

H3: perceived cost significantly negatively impact on user trust in mobile community.

Bauer introduced psychological concept of "perceived risk" to the study of consumer behavior, and argue that for any purchase it will bring a certain the consequences that is difficult to accurately

predict, and some of the consequences are unpleasant, so it produces perceived risk. Featherman thinks that the consumers mainly pay attention to privacy risks and safety risks in online consumer behavior. Taking into account the uncertainty of the mobile community and immature, the user's perception of risk may influence consumer trust in mobile community as an important factor. User perception of risk is based on the reputation of the mobile community, scale and privacy policies, in addition to data transmission speed and stability, the wireless network coverage and data encryption and so on. Therefore, we posit that:

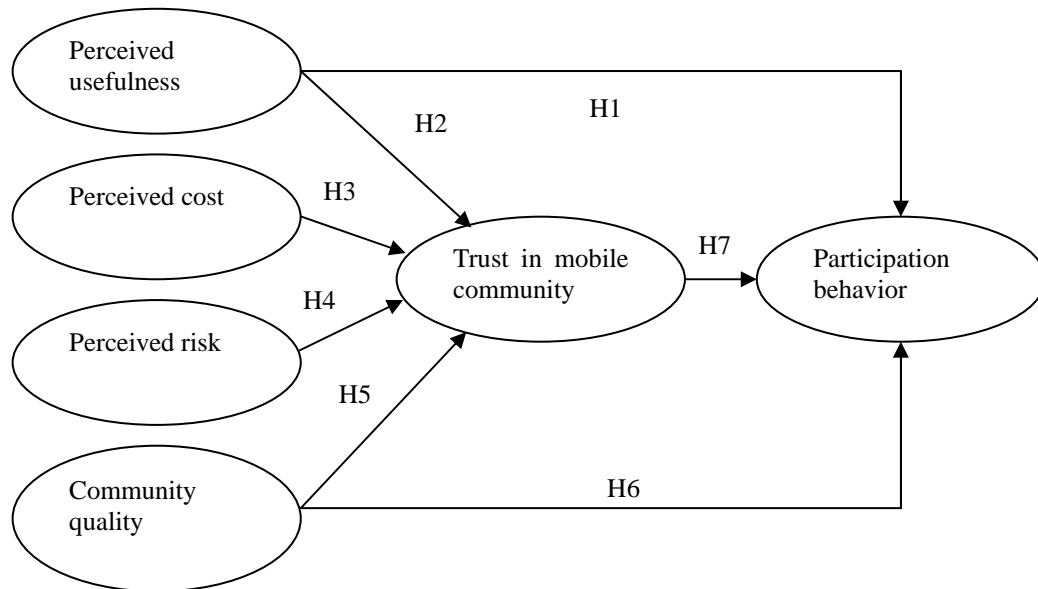


Figure 1 Research Model

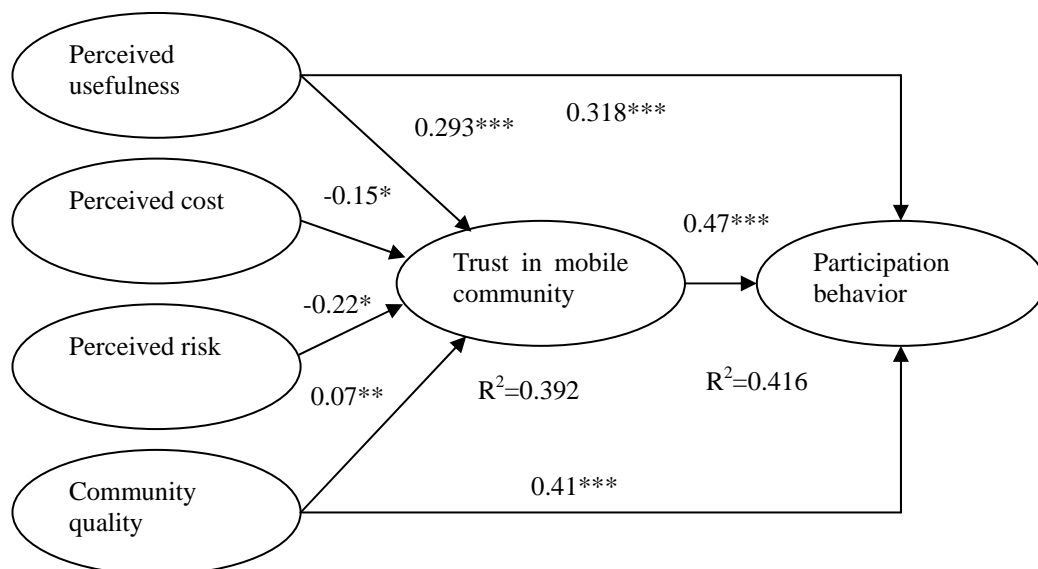


Figure 2 Model Results  
 (\*p<0.05, \*\*p<0.01, \*\*\*p<0.001)

H4: perceived risk significantly negatively impact on user trust in mobile community.

In this virtual mobile community environment, through community platform to attract users to display applications and services to achieve value. Mobile community platform, so the whole

process of using the user plays a very important role. Mobile users within the community are affected not only by the behavior of the impact of trust, but also by the quality of the mobile community platform. Most existing research on e-commerce website quality evaluation, rarely involves the quality of the mobile community platform. Huizingh think that a website can be divided into two main parts: the site content and site design. The former mainly refers to the web site contains a wide variety of information, transactions and entertainment, etc.; web design refers to how a website to present to the user, and how to make use of the website user interface, more convenient to use information. Loiacono and others find useful, entertaining, interactive information and complementary relationship is a measure of the quality dimensions of e-commerce sites. Some scholars evaluate the quality of the site from other website design, content, privacy, response time, and visual appeal and so on. Extending the result of extant studies to the context of mobile community, we hypothesize that:

**Table 1 Standard  $\alpha$  and CR**

	PU	PC	PR	MCQ	MCT	UMC
Cronbach's $\alpha$	0.826	0.874	0.879	0.841	0.819	0.890
CR	0.901	0.899	0.945	0.954	0.927	0.933

H5: Quality of mobile community significantly positively impact on the trust in mobile community.

H6: Quality of mobile community significantly positively impact on the user's participation behavior in mobile community.

Many studies show that consumers trust affect consumer motivation of purchase products and services through the network. The more consumer confidence in e-commerce site, the more likely they proceed in corresponding transactions. Extending these studies to the mobile community applications, we assume:

H7: user trust in mobile community significantly positively impact on the user participation behavior in mobile community.

#### 4 Data Processing and Hypothesis Testing

In this study, principal component analysis and confirmatory factor analysis are used to test the model. The first is the principal component analysis; we calculate sample data for the KMO value and Bartlett tests, software for data processing, the results show that, KMO value of 0.839, Bartlett test significant at 0.001 levels, indicating that the data is suitable for principal component analysis. The maximum variance after orthogonal rotation method after the load factor and the variance matrix is omitted. Six factors were extracted, explaining 75.960% of the variance. The index in the corresponding load factor is much larger than the cross-load on other factors that can effectively reflect the indicators, and corresponding factor scale has good validity. Cronbach's values of the factor and composite reliability are as shown in Table 1, the standard values and CR values are greater than 0.800 indicate scale has good reliability and the measurement items have good content consistency.

In this paper, PLS Graph3.0 is used to estimate the structural model. Model the final result of the operation is shown in Figure 2. Perceived usefulness of mobile community have a significant positive impact on trust and participation in mobile communities, and that is to verify the hypothesis H1 and H2. Perceived costs and perceived risk were significant levels significantly under the conditions of 0.5, that is to verify the hypothesis H3 and H4. Mobile community quality significantly affect mobile community trust and participation, and the path coefficient is 0.41 between mobile community quality and mobile community participation, it is larger, indicating that the quality of the mobile community has an important impact on mobile community participation. Trust in mobile community has a significant positive impact on mobile community participation under the conditions of significance level of 0.001. From calculation results of the software, it shows that the study data and model analysis is reasonable.

#### 5 Conclusion

Based on technology acceptance and innovation diffusion theory, this paper build a user

adoption of mobile community factor model under the context of mobile business, and proceed in data collection and analysis. Empirical results show that the assumptions have been verified. Perceived usefulness has a significant positive impact on trust and participation in mobile community. Through the technology acceptance model application in the mobile community environment, this paper further expands the explanatory power of the technology acceptance model. Meanwhile, the mobile community service providers should use various measures to enhance the user's perceived usefulness. On the one hand the information should be content rich mobile community, to enhance the entertainment and communication of real-time to attract more users, the other to be innovative mobile community applications to increase user stickiness, such as providing upload and download free trial listening and using. The quality of the mobile community significantly affects trust and participation in mobile community. Community interface should be user-friendly mobile, easy to operate and the user's mobile phone should be connected to a fast moving community, each specific application response time should be rapid. These areas can effectively improve the quality of the user's perception of the mobile community. Also in this research found that, due to various brands of mobile Internet software is different, and some mobile phones for different communities require different specialized client software, which increases the complexity of the user using the mobile community, reduce the user's mobile community perception of the quality. Shortcomings of this study is that mobile users to participate in community impact factor is different new changes according to the continued use of time, some users may often after a period of continued use, and some may be later used occasionally, and some may no longer use. In response to these, this article does not distinguish between the user's continued uses of time; follow-up study can be considered to continue in-depth exploration.

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## Analysis and Measuring of Real Estate Bubble in China

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**Abstract:** Since the market-oriented reforms of China's housing system from 1991, the prices of real estate have experienced a sustained rise. In particular, the rate of increase of average price of Chinese residential real estate has become more than 12% since 2004. This paper uses the measurement of Indicator Approach to find out that a series of indicators of measurement of the real estate bubble have reached and exceeded the warning line, such as the proportion of the real estate investment in GDP, housing price-earnings ratio, rents-sales ratio, which indicate that the appearance of China's real estate bubble and the trend of amplification. This paper is intended for the government to take appropriate and proportionate measures to ease the real estate bubble gradually and to provide a basis for "soft landing" of the real estate bubble.

**Key words:** Real estate bubble; Measurement; Housing price-earnings ratio; Rents-sales ratio

### 1 Introduction

Real estate, as a kind of physical assets, involves the terminal of long industrial chains of numerous industries. At the same time, it's the underlying assets of many financial derivatives and it's in a position affecting the situation as a whole. Game of the multi-stakeholders has made the price of real estate rise continually, resulting in the real estate bubble. This paper uses the measurement of Indicator Approach to find out that a series of indicators of measurement of the real estate bubble have reached and exceeded the warning line, such as the proportion of the real estate investment in GDP, housing price-earnings ratio, rents-sales ratio, ect, which indicate that the appearance of China's real estate bubble and the trend of amplification.

### 2 Trend of the Price of Real Estate in China

**Table 1 Annual Average Price of Commercial Housing and Growth Rate from 1991 to 2011 in China**

Year	Average Price of Commercial Housing (Yuan)	Growth Rate
1991	786.2	
1992	994.7	26.52 %
1993	1291.5	29.84 %
1994	1408.6	9.07 %
1995	1590.9	12.94 %
1996	1866.4	13.55 %
1997	1997.2	26.52 %
1998	2061.6	10.56 %
1999	2052.6	0.44 %
2000	2111.6	2.87 %
2001	2169.7	2.75 %
2002	2250.2	3.71 %
2003	2359.5	4.86 %
2004	2713.9	15.02 %
2005	3167.7	16.72 %
2006	3366.8	6.29 %
2007	3864	14.77 %



2008	3919	1.42 %
2009	4695	19.80 %
2010	5029	7.11 %
2011	5381	6.9 %

Source: Statistical Yearbook

From the above table, we can see that the product attributes of housing are also reflected in its price changes since the market-oriented reforms of China's housing system in 1991. From 1991 to the present, the price of real estate in China experienced a sustained rise. From 1991 to 1997, the demand of the Chinese people for housing in this stage burst out after a long-term suppression, resulting in the rapid growth of the housing prices and the investment boom. And the real estate bubble broke out in Hai nai and other provinces. As China's regulation on real estate, real estate prices in China from 1998 to 2003 were in a steadily rising phase, while the real estate prices showed a rapid growth trend since 2004. The prices grew faster than GDP growth rate in most of these years. The commercial housing prices in 2008 kept basically unchanged in comparison with those in 2007, whereas the prices rose rapidly in 2009, reaching the record 21.10%. But the annual growth rate back down again below 10% in 2010. Compared with the year of 2010, the prices increased 6.9%, while the growth rate dropped 0.6%.

### 3 Measurement of the Real Estate Bubble in China

#### 3.1 Definition of real estate bubble

In "the New Palgrave Dictionary of Economics" (1998), C.P. Kindleberger made a definition of "Bubble": "Whereas a boom or bubble is characterized by a rush out of money into real or longer-term financial assets, based on expectations of a continued rise in the price of the asset. More speculators who acquire the benefits from the difference of assets are attracted into the market. The irrational price and unsupportive conditions result in the change of expectation and the slump in the prices, and often lead to financial crisis or economic crisis." This definition vividly describes the bubble from the generation, expansion to breakdown.

Professor Joseph Stiglitz, Nobel Laureate in Economics, made a concise definition of "bubble": If the reason for the rise in prices is that investors believe that they will sell at a higher price, but the price of basic elements can not be adjusted, then there is a bubble.

From the above definition, we can sum up two main characteristics of the bubble: Firstly, imbalance of supply and demand; secondly, serious speculation. According to the above characteristics, the real estate bubble is defined as: "a manifestation of the bubble economy in the real estate, whose essence is the deviation of the price of the real estate from its value. Generally, the bubble presents in the rocketing price of the land and housing, and also in the deviation of the market price from the support of the user.

#### 3.2 Choice of the measurement indicators and decision of threshold of real estate bubble

The current methods of measurement of real estate bubble are the evaluation method of indicator, the market correction method, the statistical test method and the theoretical price method. However, for the reasons that it's difficult to determine the theoretical price of the real estate, in practice, the evaluation method of indicator is adopted to measure the real estate bubble. In this paper, the author selects the indicator of supply, demand and speculative value to make a comprehensive measure of China's real estate bubble.

##### 3.2.1 Indicator of supply

The indicator of supply mainly monitors whether the supply is excessive and whether the overheated investment occurs. The monitoring method is make horizontal comparison with the overall macroeconomic situation. The main indicators are: the proportion of real estate investment in the total fixed investment, the proportion of real estate investment in GDP, etc. in this paper, the proportion of real estate investment in GDP is adopted, which is widely used. This indicator directly reflects whether the proportion of real estate investment in the national economy is reasonable. And it's also a basic indicator to evaluate whether the expansion of the real estate investment is excessive.

Based on international experience, real estate investment-GDP ratio is generally between 3 and 8%, the construction peak is about 8%, so the threshold of the indicators is identified as 8%.

##### 3.2.2 Indicator of demand

The indicator of demand is used to monitor the non-speculative demand, which can be measured by the relationship between demand and price, the main indicators are: The housing price- earning ratio, the ratio of the growth rate of real estate and that of GDP, the ratio of the growth rate of real estate and income growth. The most comprehensive indicator is the price-earnings ratio, which reflects the relative purchasing power of residents on the housing, as well as the affordability of families for the housing price.

The ideal situation is to maintain the ratio of the housing price and average family income within a reasonable range. World Bank regards it as 3:6. The ratio is 4:6 in developing countries while generally it's 1.8: 5.5 in the developed countries. Therefore, the threshold of the indicator is identified as 7.

### 3.2.3 Indicator of speculative value

The indicator that reflects the speculative degree is the ratio of sales price of real estate and the rents, that is, rents-sales ratio. The reason why the rents-sales ratio can be able to reflect the speculative degree is that the rent is the basis to support the housing price, and that renting a house is an alternative to buying it. Meanwhile, the rent is mainly affected by the supply and demand of the market, and thus the speculative elements are relatively low. In normal circumstances, the rents should be synchronized with the housing prices, that is, the rents-sales ratio should remain stable. If the housing price that is detached from the housing price is unilaterally rapidly rising and the rents-sales ratio turns out to be abnormal, it indicates that degree of speculation in the real estate market is strengthened.

The rents-sales ratio is the ratio of the real estate price and the market rent levels, but as it is difficult to obtain the absolute value of the nationwide rent, we defines the rents-sales ratio as the comparison of the change between the price index of housing sales and that of the rents. In normal circumstances, the change of the price index of housing sales and that of the rents should be approximately equal. The threshold of this indicator is defined as 1.

## 3.3 Calculation of the real estate bubble

### 3.3.1 Proportion of real estate investment in GDP

**Table 2 Proportion of Real Estate Investment in GDP from 1991 to 2011**

Year	Investment for Real Estate (hundred million Yuan)	Gross Domestic Product -GDP (hundred million Yuan)	Proportion of Real Estate Investment in GDP
1991	336.2	21781.5	1.54 %
1992	731.2	26923.5	2.72 %
1993	1937.5	35333.9	5.48 %
1994	2554.1	48197.9	5.30 %
1995	3149	60793.7	5.18 %
1996	3216.4	71176.6	4.52 %
1997	3178.3702	78973	4.02 %
1998	3614.2292	84402.3	4.28 %
1999	4103.2024	89677.1	4.58 %
2000	4984.0529	99214.6	5.02 %
2001	6344.1107	109655.2	5.79 %
2002	7790.9223	120332.7	6.47 %
2003	10153.8009	135822.8	7.48 %
2004	13158.2516	159878.3	8.23 %
2005	15909.2471	184937.4	8.60 %
2006	19422.9174	216314.4	8.98 %
2007	25288.8373	265810.3	9.51 %
2008	31203.1942	314045.4	9.94 %
2009	36231.7	335352.9	10.80 %
2010	48267	397983	12.13 %
2011	61740	471564	13.09 %

Source: Statistical Yearbook

From the statistics in the above table, we can see that the proportion of the real estate investment in the GDP in China showed a rising trend year by year since 1997. By the year of 2004, the proportion exceeded the threshold of 8% in 2004, especially this indicator exceeded the threshold of 9 percent in 2007, while it's more than 10 percent in 2009. In 2010, the overall real estate investment in China grew rapidly, the total investment reached 4.8267 trillion Yuan, and this indicator came to 12.13%. In 2011, the total investment reached 6.1740 Yuan. In this year, the growth of real estate investment obviously slowed down, but the total amount of investment still hit the previous record by increasing 27.9%. Because of restrictions on the purchase, loan and price, the growth of national average house prices significantly slowed down, only 6.9%. This fully reflects that the investment for real estate is overextended and overheated and it signifies the emergence of early warning in the index of supply.

### 3.3.2 Housing price-earnings ratio

The housing price-earnings ratio is the ratio of housing price and household income, which is mainly used to measure whether the house price stays at a reasonable level that the residents' income can afford. It is a direct reflection of the matching degree of the level of house price and demand for living of the residents and also it's directly related to the happiness of the Chinese people.

**Table 3 Housing Price-Earning Ratio of Urban Residents from 1991 to 2011 in China**

Year	Household Earnings (Yuan)	Average total price of a housing (Yuan)	Housing Price- Earning Ratio
1991	5833.1	38292.66	6.565
1992	6829.6	49611.66	7.264
1993	8531.2	64977.95	7.617
1994	11467.5	72537.27	6.325
1995	13833.9	83759.29	6.055
1996	15484.5	98268.16	6.346
1997	16461.4	113405.01	6.889
1998	17143.3	121824.07	7.106
1999	18381.6	125036.18	6.802
2000	19656.3	134168.95	6.826
2001	21264.8	139902.26	6.579
2002	23416.5	155965.86	6.661
2003	25501.3	168319.65	6.6
2004	28076.4	202185.55	7.201
2005	31059.3	244723.83	7.879
2006	34690.5	269158.83	7.759
2007	40116.7	311240.56	7.758
2008	45922	323881.84	7.053
2009	49634.9	396880.09	7.996
2010			7.76
2011			7.5

Source: From the Database of Development Research Center of Information Network of State Council in China

From the indicator calculated in the table, the local real estate bubble turned out in the years of 1992 and 1993. From the year of 1997 to 2003, the indicator exceeded the threshold of 7. As the rise of China's urban per capita disposable income and the improvement per capita living space, the price of housing increased reasonably and the housing price-earning ratio maintained more stable, about 6.8. From 2003 to 2007, as the price grew faster than the growth rate of per capita disposable income, the housing price-earnings ratio increased significantly. From the year of 2004, this indicator exceeded the warning line once again, and showed a wandering upward trend, which reflected that the relative

purchasing power of residents on housing prices continued to decline and the real demand was squeezed by the speculative demand. In 2007, the indicator came to 7.758. Urban per capita living space in 2008 continued to be improved, and the housing price basically kept unchanged. And thus, the price-earnings ratio was significantly lowered, which was 7.053. In 2009, with the recovery of the real estate market, the real estate price in China rose largely, and thus the price-earnings ratio rose accordingly, which hit a new record of 7.996. In 2010, as the regulation on the real estate of the government, driven by the growth of the urban residents' disposable income, the housing price went down, which came to 7.76. And in 2011, it went continually down, approaching 7.5.2010.

### 3.3.3 Rents-sales ratio

Rents-Sales Ratio, generally speaking, the ordinary consumers regard it as the proportion between the housing rents and sales price. It refers to the ratio between the monthly rent per square meter of construction area and the price per square meter of construction area. It can also be viewed as the ratio between the monthly rent and the total housing price. The rents-sales ratio is an international indicator to measure whether the real estate market runs well or not in a certain region. The international standard is between 1 : 200 and 1 : 300. The higher the ratio, the bigger the investment demand for real estate. If the ratio is below 1 : 300, it means that the value of the housing investment becomes relatively smaller and that the real estate bubble turns out. If it's higher than 1:200, it indicates that the investment potential of real estate market in this region is relatively large. Whether the ratio is higher than 1 : 200 or lower than 1 : 300, it always indicates the housing price is deviated from the rational and actual housing price.

**Table 4 Rents-Sales Ratio from 1998 to 2009**

Year	Sales Price Indices of Housing	Rental Price Indices of housing
1998	106.4	102.4
1999	103.1	98.5
2000	101.8	102.4
2001	101.4	102.8
2002	103.7	100.8
2003	104.8	101.9
2004	109.7	105.5
2005	107.6	106.7
2006	105.5	103.5
2007	107.6	103.8
2008	106.5	102
2009	105.8	100.6

Source: From the Database of Development Research Center of Information Network of State Council in China

From the above table, before the year 2002, sales price index of housing and the rental price index kept in a synchronized state, which revealed that the extent of speculative degree of real estate market at this stage was limited. However, the sales price index of housing was deviated from the rental price index and showed the trend of unilateral rise, which was speculative, obviously not driven by the normal demand.

## 4 Conclusions

From the measurement of indicators of supply, demand and speculative value, it can be concluded that since the China's market-oriented reforms in 1991, the real estate market has experienced the sustained rapid growth, showing signs of prosperity or even "bubble". In particular, since 2004, the proportion of real estate investment in GDP, housing price-earning ratio and rents-sales ratio have exceeded the normal threshold, which sent early warning information from the extent of supply, demand and speculative value. So we can conclude that since 2004, China's real estate bubble turned out and it showed the trend of magnification.

But we should recognize rationally that "bubble" itself is not absolutely bad thing: In the course of development of any developed countries, real estate industry experienced a "bubble". As long as there is

growth and hope in the industry, bubble will occur, because bubble is linked with expectation and confidence.

Moderate and controlled bubble will give a positive market signal: The real estate market will maintain a continuous upward trend in a long time. Then the consumers will have faith and feel that their wealth has indeed increased, and thus they will form the confidence and desire for consumption. The wealth effect will increase their spending in other areas. And accordingly, the rise in overall consumption will stimulate further social production, and then the cycle of economic will grow rapidly. At another level, moderate and controlled bubble will attract more capital investment. The fields that are closely related to the real estate market will maintain a reasonable growth, such as steel, cement, building materials, housing decoration market. This part of growth is in turn transformed into social consumption, which will avoid overcapacity of production. We should only be vigilant against the excessive, alienation and man-made misleading "bubble".

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# Fuzzy Evaluation for the Product Strategic Aspects of Ready-made Garment Enterprise in Bangladesh

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**Abstract:** This paper aims to find out the critical factors of success in Ready-made Garment (RMG) industry of Bangladesh, especially from manufacturing engineering aspects. Basically, garment product must be competitive in terms of quality, cost and time, so the evaluation index system for the product strategic aspects has been constructed in this paper. Fuzzy analytical hierarchy process (FAHP) has been used to give evaluation to the product strategic aspects of ready-made garment enterprise of Bangladesh so that the managers can adopt the effective product strategies.

**Key words:** Engineering aspects; Ready-made Garments (RMG); AHP; Strategy; Innovative environment; Bangladesh

## 1 Introduction

A wider range of risks and uncertainties are involved with the international market than the home market. Different producer/buyer culture, business infrastructure, economic conditions, legal systems can create difficult challenges. It is agreed that an organization that is selling its product to the international market i.e., an international enterprise may adopt one of three product policies. They are; universal product, country-tailored, and modified product policy <sup>[1]</sup>. It is agreed that the product policy has to be combined with the strategy to win the market. On the basis of strategy organization may seeks to consume different amount of cost, time and quality.

Bangladesh, a developing country has achieved a good recognition in the RMG sector in international market. According to the Bangladesh Garment Manufacturers & Exporters Association (BGMEA), there are 2915 enlisted members (firms) in Bangladesh. Trade preferences schemes of BGMEA have concentrated on USA, EU, Canada, Japan, Australia, South Africa, Switzerland, Norway and New Zealand. To ensure the sustainable success and competitiveness, this paper tries to find out the critical factors from the strategic engineering aspects to market the product. The evaluation index system for the product strategic aspects is constructed. Fuzzy analytical hierarchy process (FAHP) is used to give evaluation to the product strategic aspects of ready-made garment enterprise of Bangladesh.

## 2 Literature Review

Basically, three different dimensions—quality, cost and time are involved with any product development. It is referred as strategic triangle also (e.g., Ansari, S. 1997) <sup>[2]</sup>. Organization can be unbeaten when it can produce product with the minimum cost, can ensure the highest quality and can hand over the product with the shortest possible time. But, the optimum achievement of the three dimensions simultaneously is difficult. Moreover the term ‘quality’ is relative. The term can be mutually defined with the generic strategy (Differentiation, Cost leadership and focus) of M. Porter. Product may be customized or standardized also. It is agreed that customized products have different features leading to different production costs and eventually different pricing policies <sup>[3]</sup>. Lee et al. (2001) suggested a product design that will support the mass customization <sup>[4]</sup>. It is expected that mass customization will reduce the excessive cost with keeping the opportunity of product variants within a family. Product characteristics, relationship-based selling and value received relative to price are embedded in the product quality under the context of business-to-business marketing <sup>[5][6]</sup>. Technical skill has been embedded in the quality also considering the foreign market <sup>[7]</sup>. In addition to the product quality, international technical reputation, international market orientation, and some sort of strategic orientation has been focused in case of foreign market by researcher (e.g., Roger Calantone et. al, .2000) also <sup>[8]</sup>.

Improving product quality may decrease the speed of development <sup>[9]</sup>. Time is a big term as it has many dimensions and it is associated with the different phase of the product. Time is associated with the design selected during the early stage of product conceptualization <sup>[10]</sup>. Time efficiency indicates managing resources constraints efficiently in terms of time. Therefore, scope of time efficiency is involved at every stage of business; from the supply chain management to the marketing of the product. In contemporary research, time efficiency has been a subject of innovation area also. Innovation speed

represents how quickly an idea moves from conception to a product in the marketplace <sup>[11]</sup>.

The optimum integration of quality, cost and time is still a vital area of research. Chen et al. (2012) recently use repertory grids technique and neural network to propose a quality, time and cost oriented strategy during product concept generation and selection <sup>[12]</sup>.

### 3 Methodology

On the basis of literature review, a primary questionnaire was developed. In primary questionnaire, there were 8 sub-factors under the ‘quality’, 10 sub-factors were under ‘time’, and 10 sub-factors were under ‘cost’. Data has been collected from the listed organization of BGMEA. Bangladesh Garment Manufacturers and Exporters Association (BGMEA) is the leading association in the RMG sector of Bangladesh. Data have been collected from the executive level. After discussion with the experts, factors were reduced. In final questionnaire 7, 9 and 7 sub-factors have been used under quality, cost and time respectively. MATLAB software has been used for the mathematical computing of Fuzzy analytical hierarchy process (FAHP). Fuzzy Analytical Hierarchy Process is as follow:

#### 3.1 Fuzzy set

If  $X$  is the universe of discourse and its elements are denoted by  $x$ , then a fuzzy set  $A$  in  $X$  is defined as a set of ordered pairs:

$$A = \{x, \mu_A(x) \mid x \in X\} \tag{1}$$

#### 3.2 Factor selection for the measurement

Table 1 represents the list of factors. There are two levels. The first hierarchy factor is  $F = \{F_i\}$ , ( $i = 1, 2, \dots, m$ ), which comes from the second hierarchy factor and  $\{F_{ij}\}$  ( $j = 1, 2, \dots, n$ )

#### 3.3 Evaluation index ( $\vee$ ) for the selected factors

Four different stages have been used in the evaluation scale to identify the critical factors of products’ strategic aspects. They are very highly responsible ( $V_1$ ), highly responsible ( $V_2$ ), medium responsible ( $V_3$ ) and normal responsible ( $V_4$ ) for the strategic success.

#### 3.4 Weight ( $A$ ) assessment for the selected factors

1 – 9 ratio scale has been used to formulate the decision matrix. Decision Matrix  $D$  has been formulated on the basis of the opinion of several experts consisting with the rules of Analytic Hierarchy Process (AHP). Largest Eigenvalue ( $\lambda_{max}$ ) has been used to calculate the Consistency Index ( $CI$ ) and consequently Consistency Ratio ( $CR$ ).

#### 3.5 Factor evaluation matrix $R_i$

Evaluation matrix ( $R_i$ ) has been formulated after collecting the opinion of a group of executives and professional.  $r_{ijk}$  is a membership grade that ultimately indicates the degree of evaluation grade. Evaluators’ opinion  $F_{ij}$  belongs to  $V_k$  ( $k = 1, 2, 3, 4$ ).  $1, 2, 3, \dots, n$  in  $R_i$  indicate the number of basic factors.  $1, 2, \dots, m$  indicate the evaluation factors i.e., evaluation sets  $V$ .

$$R_i = \begin{Bmatrix} r_{i11} & r_{i12} & \dots & r_{im} \\ r_{i21} & r_{i22} & \dots & r_{i2m} \\ \dots & \dots & \dots & \dots \\ r_{in1} & r_{in2} & \dots & r_{inm} \end{Bmatrix} \quad (i = 1, 2, 3, 4) \tag{2}$$

#### 3.6 Fuzzy comprehensive evaluation

Fuzzy comprehensive evaluation method is started from the lower level to the higher level in a multi-hierarchy evaluation problem. Fuzzy evaluation set in the second hierarchy:

$$B_i = A_i * R_i = (b_{i1}, b_{i2}, b_{i3}, b_{i4}) \tag{3}$$

In which  $b_{ik} = \bigwedge_{i=1}^n (a_{ij} \wedge r_{ijk}) \quad (i = 1,2,3,4; \quad k = 1,2,3,4)$

$B_1$  has been used to indicate the membership grade of evaluation object  $F_i$  to evaluation element  $V_k$  with comprehensive evaluation to each factor  $F_{ij}$ . After the second level of hierarchy, 1<sup>st</sup> level of fuzzy evaluation comes in the hierarchy.

$$\tilde{R} = \begin{Bmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{Bmatrix} = \begin{Bmatrix} A_1 * \tilde{R}_1 \\ A_2 * \tilde{R}_2 \\ A_3 * \tilde{R}_3 \\ A_4 * \tilde{R}_4 \end{Bmatrix} = [R_{ij}]_{4 \times 4} \tag{4}$$

Fuzzy comprehensive evaluation of second hierarchy;  $B = A * R = (b_1, b_2, b_3, b_4)$

In which

$$b_k = \bigwedge_{i=1}^n (a_{ij} \wedge r_{ijk}) \quad (k = 1,2,3,4) \tag{5}$$

**3.7 Handling the evaluation results**

The used grade weighted vector is  $\mu_v = (1, 0.75, 0.50, 0.25)$ . The comprehensive value can be divided into several intervals as [1, 0.75]. [0.75, 0.50]. [0.50, 0.25]. [0.25, 0] corresponding to very highly responsible, highly responsible, medium responsible and normal responsible. Calculated comprehensive value into the mentioned intervals represents the visually state of the critical strategic aspect of product. The parameter is a product of weighted vector  $\mu_v$  and  $B_k$ .

$$N = \mu_v * B_k^T = \mu_v * (b_1, b_2, \dots, b_k)^T \tag{6}$$

**4 Fuzzy Evaluation for the Index System of Garment Product Strategic Aspects in Bangladesh**

**4.1 The evaluation index system for garment product strategic aspects**

Combining some scholars' research results, the factors of garment product strategic aspects including quality, cost and time, the evaluation index system for the product strategic aspects is constructed. Table 1 represents the evaluation index system for the product strategic aspects.

**Table 1 The Evaluation Index System for the Garment Product Strategic Aspects**

	Factors	Sub-factors
The evaluation index system for the Garment product strategic aspects	Quality	Product Features Engineering Requirement Target Group Quality of Required Material Service Delivery Relationship-based selling Technical Skill
	Cost	Price Cost of Required Material Marketability Customizability Innovativeness Sustainability (Less Fluctuation) Performance Volume Affectivity
	Time	Modularity/innovation Lead-time Supply Chain Product Life time Reliability (Schedule maintaining) Complexity of Integrating Different Phase Flexibility of Time



**4.2 Fuzzy evaluation for the garment product strategic aspects**

Data have been collected from the executive level of the listed organization of BGMEA. For the basic factor decision, twenty executive opinions have been collected on binary mode. Table 2 represents the statistics of decision to identify the indexes of strategic aspects of garments product from the ‘time’. Statistics of ‘quality’ and ‘cost’ has not been presented there. Table 2 has been presented as an example of mathematical calculation.

**Table 2 Critical Factors of Strategic Aspects for Time**

	Element	Grade	$V_1$	$V_2$	$V_3$	$V_4$
			VHR	HR	MR	NR
1	Modularity/Innovation		3	13	4	0
2	Lead-time		5	12	3	0
3	Supply chain		5	14	1	0
4	Product Life Time		4	12	3	0
5	Reliability (Schedule Maintaining)		3	10	5	2
6	Complexity of Integrating Different Phase		3	8	8	1
7	Flexibility of Time		2	12	6	0

The Evaluation Matrix ( $\tilde{R}_3$ ) has been formulated from the basic matrix (table 2),

$$\tilde{R}_3 = \begin{bmatrix} 0.15 & 0.65 & 0.20 & 0 \\ 0.25 & 0.60 & 0.15 & 0 \\ 0.25 & 0.70 & 0.05 & 0 \\ 0.20 & 0.60 & 0.15 & 0 \\ 0.15 & 0.50 & 0.25 & 0.10 \\ 0.15 & 0.40 & 0.40 & 0.05 \\ 0.10 & 0.60 & 0.30 & 0 \end{bmatrix}$$

The weights ( $A_i$ ) has been determined by several experts in terms of 1-9 ratio scale value in decisions matrix  $D_i$

$$D_3 = \begin{bmatrix} 1 & 1/3 & 1 & 3 & 3 & 5 & 7 \\ 3 & 1 & 3 & 5 & 5 & 7 & 9 \\ 1 & 1/3 & 1 & 3 & 3 & 5 & 7 \\ 1/3 & 1/5 & 1/3 & 1 & 1 & 3 & 5 \\ 1/3 & 1/5 & 1/3 & 1 & 1 & 3 & 5 \\ 1/5 & 1/7 & 1/5 & 1/3 & 1/3 & 1 & 3 \\ 1/7 & 1/9 & 1/7 & 1/5 & 1/5 & 1/3 & 1 \end{bmatrix}$$

The priority vector has been calculated after the normalization of weight matrix.

$$A_1 = [0.4144 \quad 0.2202 \quad 0.0392 \quad 0.0957 \quad 0.0957 \quad 0.0957 \quad 0.0392]$$

$$A_2 = [0.2627 \quad 0.1271 \quad 0.1271 \quad 0.0564 \quad 0.0564 \quad 0.2627 \quad 0.0257 \quad 0.0564 \quad 0.0257]$$

$$A_3 = [0.1878 \quad 0.3856 \quad 0.1878 \quad 0.0862 \quad 0.0862 \quad 0.0428 \quad 0.0237]$$

$$A = [0.1429 \quad 0.4286 \quad 0.4286]$$

The calculated consistency ratio is 0.02, 0.02, 0.03 and 0 respectively which are below than 0.1 (C.R <0.1). Hence consistency is acceptable. The fuzzy evaluation (equ. 5) gives the following results,

$$\tilde{B}_i = A_i * \tilde{R}_i = \bigvee_{i=1}^4 (a_i \wedge r_{ij})$$

$$\tilde{B}_1 = [0.13 \quad 0.33 \quad 0.42 \quad 0.11], \tilde{B}_2 = [0.11 \quad 0.55 \quad 0.30 \quad 0.04], \tilde{B}_3 = [0.21 \quad 0.61 \quad 0.16 \quad 0.01]$$

$$\text{Now, } \tilde{B} = A * \left[ \tilde{B}_1, \tilde{B}_2, \tilde{B}_3 \right]^T = (0.13, 0.51, 0.30, 0.05)$$

Fuzzy evaluation has been corresponds with the different sub-factors systematically. That means  $\tilde{B}_1, \tilde{B}_2, \tilde{B}_3$  and  $\tilde{B}$  has been corresponds with  $F_1, F_2, F_3$  and  $F$ .

Fuzzy comprehensive value has been determined by parametric representation method:

$$N_1 = \mu * \tilde{B}_1^T = (1, 0.75, 0.50, 0.25) * (0.13, 0.33, 0.42, 0.11)^T = 0.62$$

$$N_2 = \mu * \tilde{B}_2^T = (1, 0.75, 0.50, 0.25) * (0.11, 0.55, 0.30, 0.04)^T = 0.68$$

$$N_3 = \mu * \tilde{B}_3^T = (1, 0.75, 0.50, 0.25) * (0.21, 0.61, 0.16, 0.01)^T = 0.75$$

$$N = \mu * \tilde{B}^T = (1, 0.75, 0.50, 0.25) * (0.13, 0.51, 0.30, 0.05)^T = 0.68$$

The defuzzification shows that concentration on the factors of ‘time’ is more required to enhance the strength of strategic engineering aspects of garment industry of Bangladesh. ‘Cost’ and ‘Quality’ is in second and third position respectively.

## 5 Conclusions

This paper aims to review the strategic aspects of RMG sector of Bangladesh. The paper reviews the strategic aspects requirement from the point of resource based view. It is agreed that resource based view (RBV) can be effective when it is matched with the contingency theory of the organization. Firm must be able to deploy the resources in ways that match the market conditions they face<sup>[13]</sup>. The result indicates that RMG sector should concentrate more on the ‘time’ issue under the current situation. However, they must be conscious about the three dimensions quality-cost-time simultaneously. J. Rodriguez-Pinto et al. (2011) mentioned that Firm should remain vigilant to shift the emphasis from speed to quality or vice versa during the development of the new product<sup>[14]</sup>. The statement is logical for the RMG sector of Bangladesh also. Efficiency of ‘time’ issue with others dimensions can promise a prospect for the RMG sector of Bangladesh. ‘Time’ with its different factors (lead time, innovation speed, supply chain, flexibility etc) can be investigated more keenly in future to handle them efficiently.

The competition in the international market is increasing day by day. Developing countries, like Bangladesh have to increase efficiency in all aspects to survive in the international market. This paper explores the situation from the strategic aspects of the resource based view of the organization. FAHP approach has been used as it is agreed that fuzzy logic helps to code the sense of human beings.

The fuzzy evaluation suggests manager of the RMG industry of Bangladesh to be more concerned about the ‘time’ factor. The combination of FAHP, RBV and contingency theory suggests RMG managers for sound management of ‘time’ regarding innovation, lead-time, supply chain, product life time, reliability, different phase integration complexity and flexibility in current situations.

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# The Research of Information Strategy of Vigorously Nonferrous Metal Industry\*

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**Abstract:** This paper analyses the main problems of the domestic vigorously nonferrous metal industry, and bases on it puts forward the development direction of its IT strategy. It takes information strategy of an typical electrolytic aluminum enterprise as the case and discusses the way to accelerate the step of informatization.

**Key words:** Vigorously nonferrous metal industry; Informatization; Information Strategy

## 1 Introduction

With the deepening of the management reform of China's nonferrous metals enterprise, the informatization work gradually shows its importance. Its core content is to speed up the automatic control technology research during the production process and improve the informatization level of operation and management. In the production control process, it uses some new technologies and new equipments such as automatic and intelligent monitoring instruments to modify the traditional processing technology in mining, milling and smelting and gradually to realize the automatic control process, thus to stabilize the production process, improve the efficiency and enhance the competitive ability of the enterprise. In the business management, it uses database technology, network technology and simulation technology, artificial intelligence and logistics technology, etc, and takes supply chain management as the base to rapidly, effectively, dynamically and coordinately configuration various resources to realize the integration of technology, management and people.

## 2 The Overview on the Condition and Problems of Nonferrous Metals Enterprise Informatization

At present, there are some problems in China's nonferrous metals enterprises, such as low efficiency, high consumption, more rough machining products and less exquisite products, high cost and poor international competitiveness. China has strengthened the informatization work to promote industrialization and industrial optimization. It provides the opportunity for nonferrous metal industry to change the backward status. In recent years, the nonferrous metal industry has done a lot of work in informatization and has obtained a certain result, but there are also some problems mainly in the following respects.

### 2.1 The enterprise's information consciousness is enhancing year by year

Most large key non-ferrous metals enterprise and part of the small and medium-sized enterprise has fully realized the importance of the enterprise's informatization for reducing the production cost and improving the core competitiveness. They could bring the informatization construction into the overall development planning process. In these enterprises, the information organizations usually have comprehensive computer centers, information centers and information management departments. Their investments of informatization are well-planned; capitals are in place; structures are reasonable. And at the same time, they pay more attention to the personnel training in enterprise information. Of course, there are also many small and medium enterprises and individual large enterprises lack proper understanding of enterprise management informatization. They have no clear information development planning. In these enterprises, there aren't special information institutions and information technology talents, they lack the understanding of the basic theory and the concept of informatization, their informatization work usually accompanies with randomness.

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## **2.2 Enterprise information infrastructure has new progress**

According to statistic, in recent years, more than 70% of the large non-ferrous metals enterprise through the management information system applications, has established a 100 M / 1000 M the layer 3 switching backbone or are to set up their own internal backbone, network node is usually covered most of the post, but to the enterprise has not been extended to workshop location and individual management department. They use more advanced hardware device, and the Internet is used to connect the one/signs line or ISDN line level. But there are also many small and medium-sized enterprises have no unified and overall planning to the construction of internal local area network. Many of the enterprise's individual department only built this department within the scope of the local area network, these results in numerous internal local area network system of department level with poor compatibility. And part of these enterprises have not any form of local area network, these enterprises' information infrastructures are limited to use a single computer in individual departments.

## **2.3 All kinds of management software preliminarily get popular applications**

Non-ferrous metal enterprise management software's implementation and application levels are uneven and different. The overall operation effect is poor. The implementation situation and effect of management software's are as follows. Enterprise management software universal system of personnel salary, financial management, product enters sells saves and sales management are more , and the enterprise in a certain scale generally get some degree of application. While software's which can reflect the characteristics of the non-ferrous metal industry production planning system, production management system and quality management system are less and get less successful application. Software's are more used in a single computer, while less shared through the network system, even if are shared is also more in the door instead of through integration in the whole enterprise. Management system and production control system are often separated and hard to realize control integration. Software's which improve the work efficiency are more, and for the decision support are less. In short, the internal utility of management software system has not been fully utilized, and the internal "information island" phenomenon of enterprises is serious. The application effect of large comprehensive and integrate management software, such as ERP, CRM, is poor. According to the survey, enterprises who strictly implemented ERP system are less. On the market, there are less powerful comprehensive management software systems with industry characteristics and the low enterprise implementation level by addition lead to that those early invested network hardware facilities of quite a number of enterprises become idle and cause serious waste. At the same time, the comprehensive management level of these enterprises has not significant improvement because of the early huge investment on hardware.

# **3 A Typical Smelting Aluminium Enterprise Information Development Strategy**

## **3.1 Analysis on the present situation of Enterprise informatization**

In 2005, this enterprise completed the hardware construction in the office building. Based on it, there are following 5 application software subsystems. (1) Financial management system. This enterprise use UFIDA financial software, but she only uses several modules, while other modules haven't be used, such as procurement, sales management and decision support subsystem. (2) Industrial control system. All of the main workshops have a computer control system, but the automation degree is low, a part of workshops have introduced advanced Germany's ELAS industrial control system, but if they want to transplant their data reports into other management system, they need to do further interface development work. (3) Salary management system. Salary management system used by personnel department is still based on FOXBASE database which compiled in the early 1990s. (4) Material management system. It can help the business enterprise realize the inventory management in the warehouse, the workshop production secondary warehouse and the alumina warehouse; realize the equipment maintenance management in fixed assets, and realize the matching purchase plan management, supplier management, in-out warehouse management and realize the data interface with financial system. (5) Office automation system. The enterprise has set up an office automation system in the office network, but the content in the information sharing module need to be enriched, and the workflow is being consummated. In addition, the Web site of the enterprise has been built.

## **3.2 Strategy analysis on enterprise informatization development**

The information development strategy of this enterprise takes customer demand as the guide and regards the establish and perfect manufacturing execution system and enterprise resource planning as the key point in order to promote the integration of production control information and enterprise

management information and comprehensively enhance the overall level of enterprise informatization and realize the efficient collaborative operation of supply chain. According to the information development strategy, the enterprise's future three main development goals are shown in figure 1 as below.

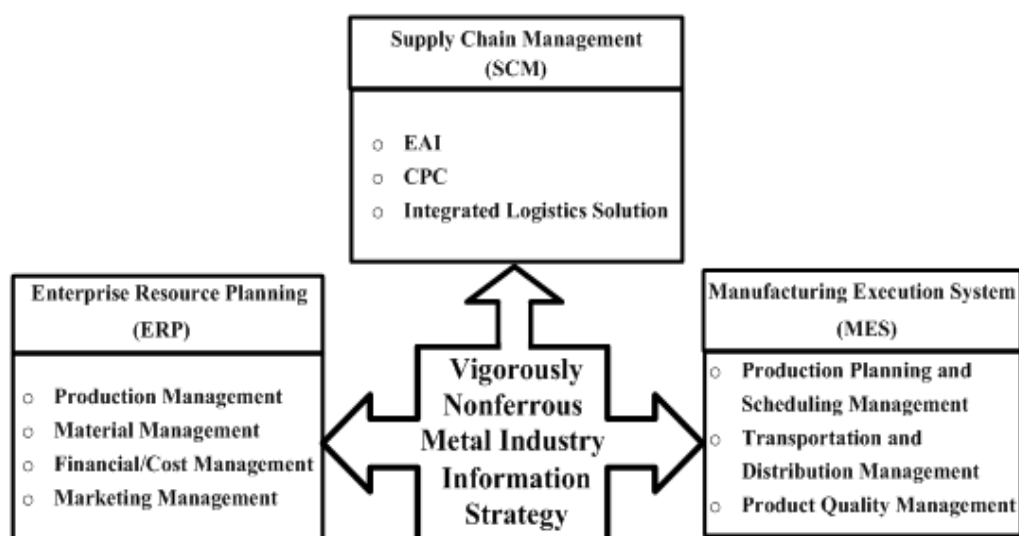


Figure 1 Information Strategy of Vigorously Nonferrous Metal Enterprise

### (1) Manufacturing Execution Systems (MES)

Through the implementation of MES, enterprises can realize the production monitoring and management. MES can also support the real time data collection of production. In a good general framework of information system in an aluminum processing enterprise, the MES at least should include following functions, such as production work order management, project management, homework assignments scheduling and tracking management, production performance and material tracking, location management of materials, batch segmentation and combination, quality management and energy management etc.. The specific functions are as follows. In data collection, it can rapidly collect the real-time process data of control system and the data acquisition system; can provide the interface of data processing and input; to collect and organize the production test data as well as filter and check the collected process data and test data, and in a long time preserve the production data. In field controlling, it can real-time monitor the production site and provide dynamic flow chart. All levels of managers can respectively browse and inquires the data they are concern with and monitor the flow accurately. MES can also provide visualization analysis tools on production data. It helps managers analyze the production status and find out the reason of production accidents and what affects the quality of products. It can also help managers make efficient decisions and optimize the process of manufacturing and operation. In the information querying, MES can realize the querying of the test data; can automatically produce report forms of shifts, days, weeks, ten-days and months and set up a quality data ledger to provide basic data for other applications, such as production management system and management system.

In addition, through the implementation of MES, enterprises can overcome the problems brought by data delays during the production operation process and human factors and strengthen the supervision of production. They can find the hidden trouble existed in the production in time so that they can reduce or eliminate accidents, stable the production, improve the efficiency and level of the production scheduling and reduce the production cost.

### (2) Enterprise Resource Planning (ERP)

To establish and perfect modern enterprise management information system is the key of non-ferrous metals enterprise informatization, and ERP is on behalf of the latest development of modern enterprise management systems. It is the direction of enterprise information work. With the increasing popularity of information technology and enterprise efficiency, ERP has got some degree of application in nonferrous metals enterprise. A part of enterprises have implemented ERP system and have made staggered results. A few enterprises adopted the ERP system of SAP Company in Germany and more chooses domestic ERP system, such as UFIDA and Kingdee after a comprehensive consideration.

Through the ERP project implementation, in financial, enterprises can regulate cost accounting method to realize financial first-level calculation and the period charge budget control of the material purchasing and management fee, operating and manufacturing expense, and automatic control of the foreign pay of cash flow to strengthen the capital risk control management. In human resource, enterprise can achieve the complete system for the future salary and welfare management to lay the foundation for the group centralized human resources management. In marketing, enterprise can realize systematic customer credit control and sales price management to get customer management unified. This systematic marketing system makes marketing centralized management get further deepening. In material management, this enterprise has realized first-degree inventory management and has also realized the business model unity of China Aluminum major raw material quality inspection sampling. They have established a unified China Aluminum material classification and coding system and realized the unified management of suppliers. They have also realized the automatic identification standard according to production consumption, real-time inventory and quality information. It makes the organization more targeted than ever before. They have also straightened out the basic management in mine, and have unified purchasing management. They have realized the unity of responsibility and power inside the system. And to meet the management needs, they have realized the business data sharing on different levels.

In addition, the implementation of ERP will have certain effect on the quality of the employees, business strategy, management thought, the management mode and management method, management mechanism, the management foundation, business process and the organization structure of the enterprise. It needs to set up a scientific, standardized and strict business management foundation to ensure that the ERP system can implement smoothly and consolidate results as well. Therefore, in the ERP application process, we must combine it with the enterprise's actual status and base on the management innovation of the enterprise.

### **(3) Based on the developed material management system to realize supply chain management**

Based on the completed material management system of the enterprise, it transplants some data in production system and strengthens the cost control to the production plan and transportation for the raw materials to realize the complete logistics tracking system. It brings basic modules of the ERP management in, and the data form a unified format in the financial system. It also establishes appropriate statistical analysis and decision support system and realizes the management mode which integrates the MES and ERP together in the supply chain. After the successful implementation of the supply chain management, enterprises can improve competitiveness, market share, customer satisfaction and obtain the biggest profit. Supply chain management takes business cooperation, cooperative competition and win-win principle as the basic operation mode. Through the use of modern enterprise management technology, information technology, network technology and integration technology to effectively plan and control the information flow, logistics, cash flow, and traffic flows in the entire supply chain, so that to make customers, vendors, suppliers, manufacturers and service providers become a complete nets chain structure and form a competitive strategy alliance.

## **4 Conclusion**

With China's accession to the WTO, the competition between the enterprises at home and abroad is inevitable. Non-ferrous metal industries also are facing opportunities and challenges. They must recognize enterprise present problems and consider the user as the center and take the market as the leading factor. They must make full use of the existing IT infrastructure to speed up the construction of the modern enterprise information management platform, to perfect production control and management informatization level and to accelerate supply chain management. They must accomplish information fusion in the production field, circulation field and related field and give full play to the information advantages. In addition, in the information process, they must strengthen the function of the management, and practically run enterprise development strategy through the daily operation process to meet the challenges of the information with standardized management, constantly update management idea and the management method and keep steady development in innovation. Only in this way, nonferrous metal industries can rapidly increase international competitiveness and occupy a place in the future competition.

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## Recognition of Neo-Tribalism on the Network

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**Abstract:** The neo-tribalism refers to a new kind of classification of people, who are not tied by same blood, customs or traditions but by similar conceptions, interests, or living styles. These new tribes mainly congregate on the internet, aging from teens to twenties. This essay concentrates on analyzing how these juveniles' neo-tribes exert their influence on the society and how they interact with other social members through the Internet. Because their behaviors inevitably reflect various social phenomena, their appearance often presents a kind of social trend, ideology, or public opinion, which will guide or affect the other juveniles' behavior positively or negatively. So, it is necessary for us to explore these neo-tribes in order to make them beautiful music notes in the construction of the harmony society.

**Key words:** Neo-tribalism; Reactive interaction; Evocative interaction; Proactive interaction

### 1 Introduction

Since the talk show “Lu Yu’s Appointment” broadcasted the series of programs “The Neo-tribalism” on CCTV, neo-tribes like the LOHAS, the Freeters, the OTAKU come into view of the public in succession. Thereafter, more than 300 hundred tribes like Zhangsan Zu, Shengnv Zu, Kenlaos Zu emerge on the Internet with an unexpected speed. More and more young people are attracted by them, from adoring, imitating to confusing. Such contradictory impact on the youth rouses the public sensation in different ways. Some socialists think that although the neo-tribes first appear as virtual groups on the Internet, they reflect people’s unsatisfied need in the real world; some politicians infer that they represent the special interest of certain groups; some psychologists study how their proposals guide their performance. More and more people immerse to find out more behind the veil of the neo-tribes. In a sense, the more we know about the neo-tribes on the Internet, the more we are clear about our society. So, in this essay, the author tries to help recognize these neo-tribes by illustrating their social interaction with the outside world.

### 2 What is Neo-Tribalism?

#### 2.1 Definition of neo-tribe

The neo-tribalism refers to the state of existing as a neo-tribe, and its significance lies in how we interpret the meaning of a neo-tribe. Neo-tribe is a coined word, and its “new” is embodied in the differences from traditional tribes in three ways. First, the tribe members have no blood relations, no common ancestors or even no customs and traditions; they only share the similar conception of values, hobbies, or living styles. Second, neo-tribes don’t live on certain land, but on a virtual world—Internet. Third, neo-tribes are mainly constructed by young people who are active on the Internet; and they are born as soon as they disappear, suddenly like the wind.

#### 2.2 Reasons for the existence of neo-tribes

The making of neo-tribes has two necessary elements: one is the human nature to belong to a group—even in a total strange society; the other is the Internet, which offers them a freer, more tolerate virtual space to communicate and congregate. That’s why we cannot deny the fact that the neo-tribes do exist in our society.

We can illustrate the reasons from angles of different sciences. In a philosopher’s view, the social existence decides human’s consciousness and human’s consciousness counter-reflects the social existence (Karl Marx).<sup>[1]</sup> The existence of neo-tribes is the result of the counteraction of objective world and subjective human desire. A psychologist will explain it in this way: one cannot live without any influence from his living circumstance. However, he never passively accepts any influence, but actively affects the circumstance, and such mutual interaction keeps on going all the time.<sup>[2]</sup> As a sociologist states, living in the kaleidoscope-like society, people prefer to manifest their differences in life attitudes, social behaviors or living habits which derive from their different social experiences and feelings. But in some particular aspects, they still show the astonishing

similarity.<sup>[3]</sup> Then, according to the above reasons, when a certain amount of individuals accumulate their similar characters to such an extent that they gain enough popularity and begin to affect the others or the society, a neo-tribe was born, and their beliefs, values and activities make a kind of neo-tribalism.

### 2.3 Categories of the current neo-tribes

At present, there are more than 300 neo-tribes appearing on the Internet. Their names not only embody the common features of their members, but also publicize their unique characters from the other groups. According to their pursued values and main characters, they are classified into the following types:

(1) Show the distinctive lifestyles, such as the LOHAS, the Freeters, the BoBos, the OTAKUs, the Zhangsangs, etc.

(2) Show the unusual patterns of consumption, such as the Moonlight, the Sleek, the window-shoppers, the feeling-followers etc.

(3) Show the multiple attitudes towards a specific problem. For example, the different attitudes towards marriage bring about the flash marriage group, the Shengnv, the concealing-marriage group, the marry-upon-graduation etc.

(4) Show the yielding attitude to some social facts, such as the child slave, the mortgage slave, the certificate slave, the exam slave, etc.

(5) Show the special hobbies or interests, such as the Cat Lover, the Hitchhiker, the Wise Traveler, the Shaiwang (those who love to show their privacy on the Internet), etc.

### 2.4 Characters of neo-tribalism

Today's neo-tribalism is largely supported by the youth, so it reflects the youth's common characters.

(1) Volunteer members. Growing up in democratic social surroundings, the young prefer to be independent and free. They tend to regard themselves as members in a neo-tribe as long as they accept its beliefs, values, attitudes or interests.

(2) Loose organization structure. The neo-tribe members congregate for the shared conceptions, interests or hobbies in some aspect, but not for an aimed target. Like the bystanders, attracted by something new or unusual, they are doomed to disperse at any time.

(3) Fluid members and changeable attitudes. There is no strict limit or a sharp distinction between neo-tribes, and the young members inadvertently care about that. They love the fun, casualness, and relaxation to join in a tribe and later convert to another as their attitudes and mood change.

(4) Surprise booming. The neo-tribes are never threatened by the young's unfaithfulness. To the contrary, the new will always appear when the old has not gone, for the young people's changeable lifestyles and diversified values make them alive all the time. Because of them, the social life becomes more colorful and more complex. So knowing them, we can discern how the social phenomena reflect and act on people's psychology.

## 3 How the Neo-Nribes interact with the society?

The neo-tribes are born in the particular social environment, and in turn react on it. As we know, an individual often interacts with his outer settings in three ways: the reactive interaction, the evocative interaction and the proactive interaction.<sup>[4]</sup> As similar individuals tend to congregate groups and reveal their characters as integrity, the neo-tribes do interact with their dependent society in the similar way.

### 3.1 The reactive interaction

The reactive interaction defines that when facing the same environment, different neo-tribes will sense it, experience it and interpret it in different ways. For example, when the newly graduates aged twenties encounter the choices about their future, some decide to be *Kaowan Zu* (the "stable job seekers"), for they think the public servants as the only ideal jobs worthy to be struggling; some prefer to be "*Bihun Zu*", marrying upon graduation to escape pressures from the job competition; others are determined to be "*Ant Tribes*", striving for their goals from zero and springing up from the lowest substrata in the metropolis. The different choices are mainly due to the individual differences, which derive from different psychological factors, congenital conditions and posteriori circumstances (Defleur, 1975).<sup>[5]</sup> Such differences contribute to people's

different character development and behavioral mode, which can best explain the phenomena that the young people with the similar education background take the totally different ways after graduation.

### **3.2 The evocative interaction**

The evocative interaction means that some representative characters and conducts of the neo-tribes will arouse the public's particular attention or reaction to them. The public pays different attention to social groups, and to the weak groups, they usually treat them with sympathy and compassion. But, if some weak groups, with the aid of the media, continue to express their emotions and emphasize their demands, they will strengthen the public's concern and force them to react extraordinarily. At that time, the sympathetic attitudes will escalate to offer help. For example, "*Taoxin Zu*", (the salary seekers), represented by peasant workers and contracted workers, often obtain the social support and relief by evoking the public's sense of justice and responsibilities. Once the press helps them appeal in public, the involved entrepreneurs will be denounced for their illegality and dishonesty. Another group, "*Fang Nu*", who are under the pressure of house mortgage, try to make themselves heard by the central government. As a result, a series of related policies are put in place to help better their living conditions. The media help circulate the social groups' worries, concerns and demands in the public sphere, which make "the present oppressed realize the oppression, and the present oppression become much heavier"(Karl Marx). To enter the public domain by arousing the public's attention is an effective way for neo-tribes to be recognized by the society.

### **3.3 The proactive interaction**

The proactive interaction refers to the phenomenon that an individual in a neo-tribe can actively choose and construct his favorite circumstances, and in turn, the preferred circumstances help build his personal characters. For instance, the *Lehuo Zu* (also called *LOHAS*, "Life styles of Health and Sustainability" for short) advocate the healthy, low-carbon, environment-friendly living style. In their lives, they prefer walking to driving, the recyclable to the disposal, and the natural food to the processed. Consequently, such lives help shape their natural, simple and positive characters. The same case in point is the *Lv Zu* (the travel fans). Loving nature and travel is the main reason for them to create every chance to travel, and travelling in nature frequently contributes a lot to mold their vigorous, frank and adventurous characters. So, no matter how the society develops, human beings will never feel satisfied with their environment. They tend to select and construct a suitable environment to meet their need. And at the same time, they are constrained and influenced by their chosen environment. The two parties are always in the course of dynamic interaction.

## **4 The Influence the Neo-Tribalism Exerts on the Social Life**

### **4.1 The neo-tribalism interferes with the social perception**

The social perception mainly refers to the cognition and understanding of human.<sup>[6]</sup> It studies a complicated process that how people judge others' motives, characters, intentions or attitudes by social communication. Like dropping a small pebble in the still lake, the emergence of neo-tribalism usually creates far-reaching ripples and affects the society perception. For instance, when the society is aware of the coming and blooming of a new tribe, it gets the "first impression" from its novel name. But the name seems to concentrate more to attract eyeballs than to elaborate itself clearly. As a result, the false association of names often interfere with the system of social perception, producing some psychological suggestions such as stereotyped image, halo effect etc. and causing some radical attitudes. Once the social attitudes toward a neo-tribe have come into being, many factitious obstacles will be set unavoidably between their interactions.

### **4.2 The neo-tribalism affect young people's character development.**

When the neo-tribalism is prevailing on the Internet, young people are most liable to be infected. Because they are at the sensitive stage, their body, mind and character are easily changed by the outside influence. When plunging into the Internet without any protection from their belief or value, they tend to accept more before they can perceive the righteous and the wicked, which will contribute to the making of a marginal personality. According to a study, people with marginal characters are more likely to break the established norms and ignore the social orders or principles. The young with marginal personalities usually appear some characters like wandering soul, conflicting values which will make them behave disorderly or suffer the mental anxiety. If they keep this kind of uncertainty in the process

of building their life values or world values, they will lose the power to make judgment between the good and the evil. They will find themselves playing all kinds of roles in the reality but to their sadness, they cannot recognize their real selves. They belong to such susceptible population and tend to be misled by the seemingly fantastic neo-tribes.

## 5 Conclusion

Nowadays, China is concentrating on building a harmonious society. To the government, knowing these neo-tribes is the best way to know her people, for she can adjust the existing policies which could have hurt people's interest in some way, and invent the new to bring more benefits to them. At the same time, the public are invited to judge the legality of neo-tribalism, which determines, in a way, the lifespan of some tribes. To those with positive spirit, the public is tolerant and helpful to promote their growth; to those with negative intention, (usually confusing people's conscience and defying the established order), the public will launch a nationwide argument to test their values. Once the consensus is achieved, people can reject their further erosion voluntarily. Thus, the positive ones will live longer than the negative, for human beings are inclined to pursue and support the virtue and the truth in any society. Only by doing so, the neo-tribalism and the society can really achieve a kind of cooperative harmony.

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# Modern Digital Signal Processing in Reference to Image Compression

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**Abstract:** The purpose of this purpose is to compress images while maintaining acceptable image quality. This is achieved by dividing the image in blocks of 8×8 pixels and applying a discrete cosine transform (DCT) on the partitioned image. The resulting coefficients are quantized; less significant coefficients are cut off. After quantization, two encoding steps are made, zero run length encoding (RLE) followed by an entropy coding. Part of the JPEG encoding is lossy, and part is lossless. JPEG allows for some flexibility in the different stages, not every option is explored. Here the entropy coding will only be briefly discussed and the file structure definitions will not be considered.

**Key Words:** Modern digital signal; Processing; Image Compression

## 1 Introduction

A digital signal processor (DSP) is a specialized microprocessor with an architecture optimized for the fast operational needs of digital signal processing (Yovits, Marshall C., 199 & Liptak, Béla G. , 2006 ). Also signal processing is an area of systems engineering, electrical engineering and applied mathematics that deals with operations on or analysis of signals, or measurements of time-varying or spatially-varying physical quantities. Signals of interest can include sound, images, and sensor data, for example biological data such as electrocardiograms, control system signals, telecommunication transmission signals, and many others. According to Alan V. Oppenheim and Ronald W. Schafer, the principles of signal processing can be found in the classical numerical analysis techniques of the 17th century. They further state that the "digitalization" or digital refinement of these techniques can be found in the digital control systems of the 1940s and 1950s (Oppenheim, Alan V.; Schafer, Ronald, 1975).

Digital signal processing algorithms typically require a large number of mathematical operations to be performed quickly and repeatedly on a set of data. Signals (perhaps from audio or video sensors) are constantly converted from analog to digital, manipulated digitally, and then converted back to analog form. Many DSP applications have constraints on latency; that is, for the system to work, the DSP operation must be completed within some fixed time, and deferred processing is not viable. Most general-purpose microprocessors and operating systems can execute DSP algorithms successfully, but are not suitable for use in portable devices such as mobile phones and PDAs because of power supply and space constraints. A specialized digital signal processor, however, will tend to provide a lower-cost solution, with better performance, lower latency, and no requirements for specialized cooling or large batteries. The architecture of a digital signal processor is optimized specifically for digital signal processing. Most also support some of the features as an applications processor or microcontroller, since signal processing is rarely the only task of a system. Some useful features for optimizing DSP algorithms are outlined below.

### 1.1 Typical Operations and Applications

The goals of signal processing can roughly be divided into the following categories.

(1) Signal acquisition and reconstruction, which involves measuring a physical signal, storing it, and possibly later rebuilding the original signal or an approximation thereof. For digital systems, this typically includes sampling and quantization.

(2) Quality improvement, such as noise reduction, image enhancement, and echo cancellation.

(3) Signal compression, including audio compression, image compression, and video compression.

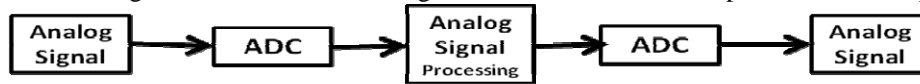
(4) Feature extraction, such as image understanding and speech recognition.

In communication systems, signal processing may occur at OSI layer 1, the Physical Layer (modulation, equalization, multiplexing, etc.) in the seven layer OSI model, as well as at OSI layer 6, the Presentation Layer (source coding, including analog-to-digital conversion and data compression).

## 2 Categories of Signal Processing

### 2.1 Analog signal processing

Analog signal processing is for signals that have not been digitized, as in legacy radio, telephone, radar, and television systems. This involves linear electronic circuits such as passive filters, active filters, additive mixes, integrators and delay lines. It also involves non-linear circuits such as commanders, multiplications voltage control filters, and voltage controlled oscillators and phase –locked loops.



NB:- ADC = Analog Digital Converter

Figure 1 A Simple Block Diagram of A Typical Digital Signal Processing System

### 2.2 Discrete time signal processing

Discrete time signal processing is for sampled signals that are considered as defined only at discrete points in time, and as such are quantized in time, but not in magnitude. Analog discrete-time signal processing is a technology based on electronic devices such as sample and hold circuits, analog time-division multiplexers, analog delay lines and analog feedback shift registers. This technology was a predecessor of digital signal processing and is still used in advanced processing of gigahertz signals. The concept of discrete-time signal processing also refers to a theoretical discipline that establishes a mathematical basis for digital signal processing, without taking quantization error into consideration.

### 2.3 Digital signal processing

Digital signal processing is the processing of digitized discrete time sampled signals. Processing is done by general-purpose computers or by digital circuits such as ASTICs, field programmable gate arrays or specialized digital signal processors (DSP chips). Typical arithmetical operations include fixed- point and floating -point, real-valued and complex-valued, multiplication and addition. Other typical operations supported by the hardware are circular buffers and look-up tables. Examples of algorithms are the Fast Fourier transforms (FFT), finite impulse response (FIR) filter, Infinite impulse response (IIR) filter, and adaptive filters such as the Wiener and Kalman filters.

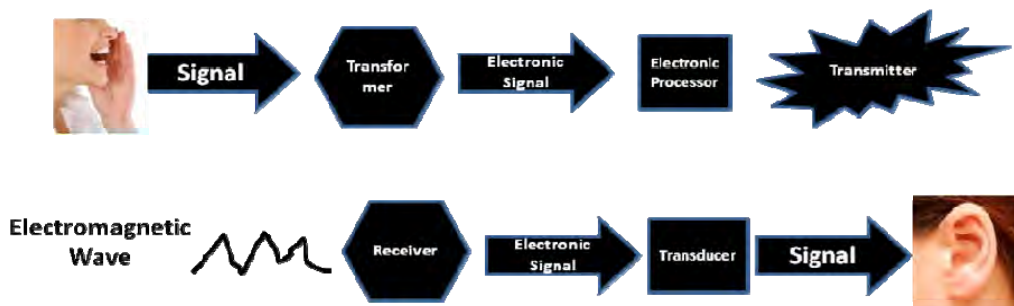


Figure 2 A typical Digital Processing System

The amount of information required to store pictures on modern computers is quite large in relation to the amount of bandwidth commonly available to transmit them over the Internet and applications like video where many thousands of pictures are required would be prohibitively intensive for use on most systems if there wasn't a way to reduce the storage requirements of these pictures (G. K. Wallace, 1991).

A still image is a sensory signal that contains significant amount of redundant information which exists in their canonical forms. Image data compression is the technique of reducing the redundancies in image data required to maintain a given quantity of information. Therefore, data storage requirements and communication costs are decreased. In digital image compression, data redundancy is the main issue and better compression can be achieved by reducing more data redundancy with a degree of quality. There are three types of basic data redundancies: coding redundancy, inter-pixel redundancy, and perceptual redundancy.

Coding redundancy occurs when the codes assigned to a set of events such as the pixel values of an image have not been selected to take full advantage of the probabilities of the events (Jian Jiun Ding and Jiun De Huang, 2007). Inter-pixel redundancy usually refers to the correlations

between the structural or geometric relationships of the objects in an image. Due to the high correlation between the neighboring pixels, any given pixel can be easily predicted from the values of its neighboring pixels, so the information carried by individual pixels can be relatively small. Any information is said to be perceptually redundant if certain information simply has less relative importance than other information in terms of the human perceptual system. For instance, all the neighboring pixels in the smooth region of a natural image have a very high degree of similarity and this insignificant variation in the values of the neighboring pixels is not noticeable to the human eye. The data size of Fig. 1(a) is 83,261 bytes, and the data size of Fig. 1(b) that is compressed by JPEG is 15,138 bytes which is approximately 1/5 of the former one. As the result, it is hard to distinguish Figure 3 (a) and Figure 1(b).



Figure 3 (a) Original Image (83,261 bytes).

Figure 3 (b) JPEG Compressed Image (15,138 bytes)

### 3 Basic Ideas Analysis of Still Image

#### 3.1 Pixel

In digital image, a pixel is a single point in a raster image. The pixel is the smallest addressable screen element shown in Fig. 4 below; it is the smallest unit of picture that can be controlled. Each pixel has its own address. The address of a pixel corresponds to its coordinates. Pixels are normally arranged in a 2-dimensional grid, and are often represented using dots or squares. Each pixel is a sample of an original image; more samples typically provide more accurate representations of the original. The intensity of each pixel is variable. In color image systems, a color is typically represented by three or four component intensities such as red, green, and blue.

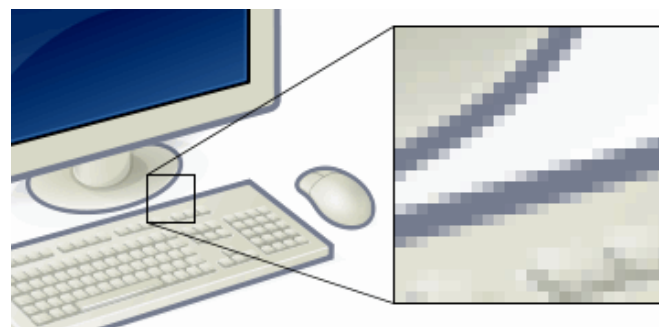


Figure 4 Pixel is Smallest Element of an Image

#### 3.2 RGB color image and grayscale image

When the eye perceives an image on a computer monitor, it is in actually perceiving a large collection of finite color elements, or pixels. Each of these pixels is in and of itself composed of three dots of light; a green dot, a blue dot, and a red dot. The color the eye perceives at each pixel is a result of varying intensities of green, red, and blue light emanating from that location. A color image can thus be represented as 3 matrixes of values, each corresponding to the brightness of a particular color in each pixel. Therefore, a full color image can be reconstructed by superimposing these three matrixes of



“RGB”. If an image is measured by an intensity matrix with the relative intensity being represented as a color between black and white, it would appear to be a grayscale image shown in Figure 4.

**3.3 Grayscale**

The intensity of a pixel is expressed within a given range between a minimum and a maximum, inclusive. This range is represented in an abstract way as a range from 0 (total absence, black) and 1 (total presence, white), with any fractional values in between. This notation is used in academic papers, but it must be noted that this does not define what "black" or "white" is in terms of colorimetry. In computing, although the grayscale can be computed through rational numbers, image pixels are stored in binary. Some early grayscale monitors can only show up to sixteen (4-bit) different shades shown in Fig. 5 below, but today grayscale images intended for visual display are commonly stored with 8 bits per sampled pixel, which allows 256 different intensities to be recorded, typically on a non-linear scale. The precision provided by this format is barely sufficient to avoid visible banding artifacts, but very convenient for programming due to the fact that a single pixel then occupies a single byte.

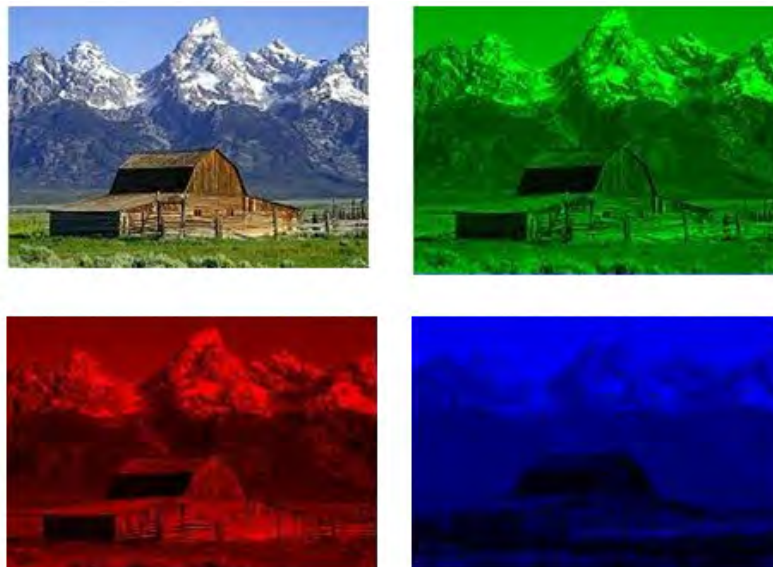


**Figure 5 4-bit grayscale**

**3.4 YUV color space**

What exactly is YUV when talking about video? Indeed it’s a way of breaking the brightness and colors in the image down into numbers, and it’s a little different from RGB, Just as a refresher, most cameras take the light coming into the lens, and convert that into 3 sets of numbers, one for Red, one for Green, and one for Blue. This is called RG. There is one big problem with RGB color – it’s tough to work with. If we need to lower the brightness uniformly on an image, we need to do it to all 3 colors. There’s also a lot of redundancy in the data. To combat this redundancy, there is a different way of storing the information called YCbCr, which breaks the signal down into a Y, or luminance channel, and 2 channels that store color info without brightness info – a Blue channel and a Red channel that don’t contain any brightness.

The correct way to abbreviate this would be Y, Cb, and Cr. However, I want you to try saying YCbCr 10 times, and compare that with saying RGB 10 times. Y, Cb, Cr, is a mouthful. Some engineer somewhere decided that saying YCbCr was just too inconvenient, and borrowed another color term, YUV, to use instead. Technically speaking, saying “YUV” to describe YCbCr is not accurate at all, but the name stuck, and so now, most people who are talking about YCbCr use the term YUV incorrectly. Below in Figure 2, there is a graphic from the Wikimedia Commons site that shows RGB breakdowns of a frame (See figure 6 below).



**Figure 6 A color image is made up of three matrices**



As you can see, the full color image is separated into a Red channel, a Green Channel, and a Blue channel. In the above figure we observed that the same image, broken down into YUV channels. In the case of a color RGB picture a point-wise transform is made to the YUV (luminance, blue chrominance, red chrominance) color space. This space in some sense is more efficient to be decor related than the RGB space and will allow for better quantization later. The transform is given by:

$$\begin{bmatrix} Y \\ U \\ V \end{bmatrix} = \begin{bmatrix} 0.299 & 0.587 & 0.114 \\ -0.1687 & -0.3313 & 0.5 \\ 0.5 & -0.4187 & -0.0813 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix} + \begin{bmatrix} 0 \\ 0.5 \\ 0.5 \end{bmatrix},$$

And the inverse transform is

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 1 & 0 & 1.402 \\ 1 & -0.3444 & -0.71414 \\ 1 & 1.772 & 0 \end{bmatrix} \begin{bmatrix} Y \\ U - 0.5 \\ V - 0.5 \end{bmatrix}.$$

### 4 Basic Image Compressed Model

The JPEG compression process contains three primary parts as shown in Fig. 7. First, to prepare for processing, the matrix representing the image is divided into 8x8 squares. Here the size was dependent on the balance between image quality and the processing power of the time and passed through the encoding process in chunks. To reverse the compression and display a close approximation to the original image the compressed data is fed into the reverse process as shown in Fig. 8. These figures illustrate the special case of single-component image compression. Color image compression can then be approximately regarded as compression of multiple grayscale images, which are either compressed entirely one at a time, or are compressed by alternately interleaving 8x8 sample blocks from each in turn.

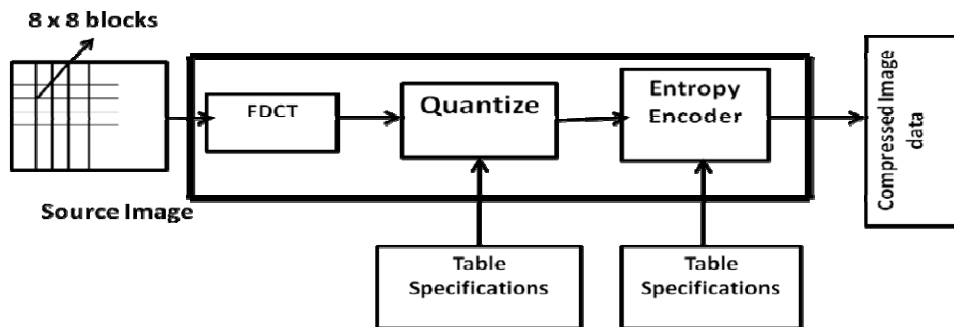


Figure 7 JPEG Encoding Flow Chart

Where by FDCT =Forward Discrete Cosine Transform.

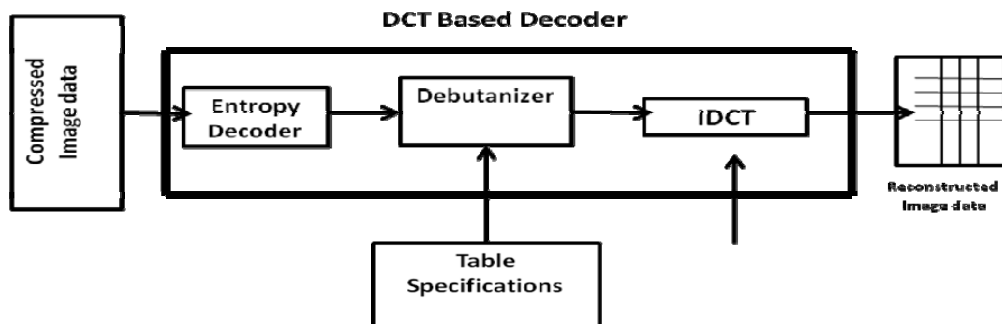


Figure 8 JPEG Decoding Flow Chart

Where by Discrete Cosine Transform.

## 5 Conclusion

Modern signal processors (DSP's) yield greater performance; this is due to both technological and architectural advancements like lower design rules, fast-access two-level cache. Not all DSP's provide the same speed and many kinds of signal processors exist, each one of them being better suited for a specific task, Before the JPEG 2000, the JPEG lossy compression scheme is one of the most popular and versatile compression schemes in widespread use. The term "JPEG" is an acronym for the Joint Photographic Experts Group which created the standard. The JPEG can efficiently compress image without severe distortion and cost less for implement. Due to this, modern digital signal processing became the focus in this article. And this paper investigates JPEG compressing process by dividing the image in blocks of 8×8 pixels and applying a discrete cosine transform on the partitioned image.

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## Strategic Analysis on Logistics and Public Information Sharing Platform of Hubei Province of China

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**Abstract:** This paper mainly analyses Hubei Province's modern logistics and its logistics information technology development status, and compares Hubei Province's logistics status with eastern coastal Provinces' logistics development status. To analyze and research the necessity of building Hubei Province's logistics and public information sharing platform from the aspects of economy, environment and policy.

**Key Word:** Logistics; Logistics Information; Information Sharing Platform

### 1 Introduction

In today's economic society, which is made up of consumption, production and circulation, logistics has become a tool to shorten the distance between producers and consumers both in time and space. Because, no matter producers or consumers; they both don't want to spend too much time on circulation, which makes the function of logistics become more and more important. Logistics and public information sharing platform as an information sharing platform can help to shorten circulation time, it can quickly and efficiently handle a variety of information that produced from all aspects of manufacturing, transportation, handling, processing, distribution, etc, and deliver these information accurately and quickly to all the related enterprises and logistics companies and relevant government departments that on the logistics chain through logistics and public information sharing platform. <sup>[1]</sup>

### 2 The Logistics Status of Hubei Province of China

In recent years, the logistics industry of Hubei Province has being in a strong development situation, and it is transiting from the initial stage to the stage of rapid development. Gradually, it has become the pillar industry of Hubei Province's economic development, and made very important contributions to the Province's economic development. However, for the present, the overall development of logistics industry in Hubei Province is still very low, and it has a big gap compared to the eastern coastal Provinces. Besides, there are a range of issues, such as the economic development is limited, the technological level is low, and the logistics information resources are single and fragmented, and the government policies do not reach the designed position, and so on.

#### 2.1 The status of Hubei Province's logistics industry development

From 2006 to 2010, the total logistics operation of Hubei Province has increased from 1.7586 trillion Yuan to 3.5257 trillion Yuan, the annual average growth is 14.2%; among this the logistics added value has increased from 54.2 billion Yuan to 110 billion Yuan, the annual average growth is 14.6%, accounts for Hubei Province's GDP is about 7%. Among them, the volume of goods transported has increased from 529 million tons to 969 million tons, the annual average growth is 14.3%; and the cargo turnover has increased from 173 billion tons per kilometer in the year of 2006 to 336.7 billion tons per kilometer in 2010, the annual average growth is 18.1%. Up to the year of 2010, logistics costs accounts for the Province's GDP is about 17.6%. Although the level of its development is better than the national average, it is still has a big gap compared to the eastern coastal Provinces. Table 1 shows the statistics of the logistics development indicators in Hubei Province from 2006 to 2010.

**Table 1 Statistics of the Logistics Development Indicators in Hubei Province from 2006 to 2010**

Index Years	Gross social logistics(unit: one hundred million Yuan)	The added value of the logistics industry (unit: one hundred million Yuan)	Cargo traffic(unit: one hundred million Yuan)	Goods transportation turnover(unit: one hundred million tons per kilometer)	Logistics cost account for GDP (unit: %)
2006	17586	542	5.29	1730	18.2
2007	21158	660	5.85	1911	18.1

2008	24813	799	7.58	2700	18.1
2009	27309	903	8.27	2808	17.7
2010	35275	1100	9.69	3367	17.6

It is easy to see from the table that most of the logistics industries in Hubei Province in recent years have maintained a rapid speed of development and the logistics indicators are well improved.<sup>[2]</sup>

Based on this favorable development trend, in “the Twelfth Five-Year Plan” period, Hubei Provincial government will do its best to promote the construction of a modern logistics network system, and unite all its prefecture-level cities to construct a modern logistics circle. The logistics circle makes Wuhan city as its center, and relying on the natural advantages of the Yangtze River economic belt, to drive the development of logistics industry and build the logistics circle in all the prefecture-level cities of Hubei Province. Currently, Hubei has already built a logistics circle that makes Wuhan city as its center and other eight prefecture-level cities like Tianmen, E'zhou, Xiaogan, Huangshi, Huanggang, Xiantao, Qianjiang and Xianning as its extension. And it has built the logistics network, which can not only coordinate the economic development of Hubei Province, but also to promote the formation of the integration of Hubei Province's logistics industry. Table 2 lists its neighboring cities' logistics bases that have been built or under been constructing and the total investment of each logistics base.

**Table 2 Other Prefecture-Level Cities' Logistics Bases and Their Total Investment**

Name of the logistics base	Total investment (a hundred million)	Name of the logistics base	Total investment (a hundred million)
The logistics base of Huangshi	9.2	The logistics commercial center of Taipingxi port	68
Comprehensive logistics base of E'Huang	14	Logistics distribution center of Yizhong	1.8
Feature agricultural products logistics base of Xianning	2.6	Comprehensive logistics base of Jingzhou	8.7
Comprehensive logistics base of Xiantao	7.5	Agricultural products transport logistics base in Jingmen	8
Feature agricultural products logistics base of Xiaogan	0.42	Contrary comprehensive logistics base	12
Logistics circle of Yijing	1.1	Distribution model logistics base of Shiyan	4.4
”Wujiagang-Xiaoting” logistics base of Yichang	16.3	Agriculture products logistics base of Suizhou	9.9

## 2.2 The resources condition of logistics information in Hubei Province

Hubei Province is located in the hinterland of the central plains and it has a convenient transportation. In our country, it plays an important role in transportation. The role of Hubei Province's transportation network plays the role of communicating north and south, linking the east and west. Compared with other Provinces, it has inherent geographical advantages. As we all know, not only Jingjiu and Jinguang railway but also Yangtze river and Hanjiang river across it. Depend on these advantages, Hubei Province has formed a comprehensive logistics transport network that is made up of railways, waterways, roads, pipelines, and aviations, play the role of connecting the logistics of the urban and rural areas and communicating internal and external Province logistics.

In the construction of the public information platform, it has initially formed a more perfect personal and digital communications, cable television and computer networks, the comprehensive communication capabilities significantly enhanced. As long as rapid development of unlimited electronic technology such as GPRS tracking technology, RFID, wireless data communication technology, intelligent transportation technology, wireless data communication technology, research and development of electronic data interchange technology, geographic information systems technology, and MMDS multi channel microwave transmission technology, brought the information technology development of Hubei Province in the front of the whole country, and provide an enabling technology to its modern logistics information construction.

Today, the Hubei provincial government has taken the development of logistics as a key task to develop its economy, and has come up with clear ideas and relevant policies to promote its logistics

development, and they have formulated a series of logistics planning that suitable for the actual economic situation and political situation of Hubei Province. And they proposed to rectify the existing logistics companies, completely changed the small scale, scattered, and disorder management situation, to provide a favorable environment for the development of the modern logistics and the construction of logistics and public information sharing platform in Hubei Province. To strengthen on Hubei Province's modern logistics development of organization and management, full play the role of all government sectors, it has established a modern logistics joint conference system that leded by Hubei Province development reform Committee, joint financial, traffic, police, trade, business, land resources, and logistics enterprise, etc, total 15 sectors, and provide a favorable policy support for the construction of Hubei Province's modern logistics information and logistics and public information sharing platform. [3]

In addition, there are many universities in Hubei Province. Wuhan City alone has more than one million students, which can provides a wealth of human resources for the development of its logistics information and logistics and public information sharing platform. Now, many colleges in the Province based on the current market needs have offered various logistics courses, relevant research institutions also have active research the modern logistics, and the Province is focus on training and introducing logistics professionals, and it also vigorously carried out logistics talents education, then laying a solid foundation for Hubei Province's development of modern logistics and construction of logistics and public information sharing platform.

At present, the logistics information in Hubei Province both in economic, technical, policy and human resources are maturing and promoting the development of modern logistics in Hubei Province and the establishment of logistics public information platform.

### 3 The Comparison Between Hubei Province's Logistics and Our Country's Other Coastal Provinces Logistics

China has a vast territory, the economic development of the three regions of eastern, central and western is unbalanced, the economic development of eastern coastal areas is rapid, the logistics demand is flourish and the logistics development is in a higher level; however, due to economic, regional, and national policy reasons for the restrictions in the central and western regions, the development of the logistics is in a low level, developing the logistics industry is difficult. Table 3 is the list of Forbes 2006 about the logistics development of Chinese city.

**Table 3 The List of Forbes 2006 about the Logistics Development of Chinese City**

ranks	cities	the size of market index	operating cost index	transport index	Provinces and cities
1	Shanghai	0.47109	0.86421	0.00000	Shanghai city
2	Guangzhou	0.47992	0.88395	0.02751	Guangdong Province
3	Ningbo	0.44307	0.73395	0.14721	Zhejiang Province
4	Hang Zhou	0.37607	0.75868	0.18584	Zhejiang Province
5	Yantai	0.20746	0.58211	0.21071	Shandong Province
6	Jinhua	0.34811	0.63289	0.29909	Zhejiang Province
7	Beijing	0.42335	1.00000	0.21744	Beijing city
8	Jinan	0.27044	0.66763	0.24641	Shandong Province
9	Dongguan	0.66395	0.46079	0.44747	Guangdong Province
10	Shenzhen	1.00000	0.83658	0.30348	Guangdong Province
11	Wuxi	0.30682	0.54868	0.36348	Jiangsu Province
12	Tianjin	0.23608	0.89500	0.02312	Tianjin city
13	Fuzhou	0.23213	0.55579	0.30465	Fujian Province
14	Yueyang	0.17280	0.27500	0.38045	Hunan Province
15	Dalian	0.17681	0.71421	0.07550	Liaoning Province
16	Nanjing	0.23327	0.83421	0.14106	Jiangsu Province
17	Wuhan	0.14631	0.60474	0.07316	Hubei Province

It can be seen from the table that the logistics development of Hubei Province only Wuhan in the top 17 cities and it ranks 17<sup>th</sup>. Wuhan represents the center of the economic development and the core of

logistics development of Hubei Province, its development directly impacts on the economic development of the whole Province. However, the eastern coastal Provinces such as Shandong, Zhejiang, Jiangsu, Guangdong, there are more cities in the top 17, from here we can clearly see the gap between the logistics in Hubei Province and the logistics in eastern coastal Provinces. Therefore, if we want the rapid development of the overall economy of Hubei Province, we must strive to reduce the logistics gap with the coastal cities, and make efforts to accelerate the development of modern logistics information technology in Hubei Province. Logistics information sharing platform as an extension of logistics information and support, which plays a very important role, also makes the demand for logistics and public information sharing platform will be more urgent.

#### 4 Conclusion

Although, Hubei Province has a natural advantage on the development of modern logistics, over the past few years, these advantages are not reflected. The reason is, we find that, in Hubei Province, there are independent operations among the logistics bases which have been built or under been building, and there are almost no information exchange and communication between them. This situation not only caused some shortcomings of the logistics information resources, such as single, fragmented, slow update, but also not conducive to the unified management of the government. This makes the Hubei Province is urgent need to build a logistics and public information sharing platform to integrate the fragmented logistics information, and process, handle, integrate, filter, share the mutually inconsistent information and data from different regions, different departments, different channels, then to provide information to support logistics planning and logistics decision-making, for the Province of local governments, businesses, modern logistics information systems support for the Province of small and medium enterprises. The following parts will analyze the necessity of the construction of the logistics public information sharing platform respectively from three aspects; they are economic necessity, environment necessity and policy necessity.

Economic necessity: in the environment of global economic integration, goods are flowing freely with a high speed in the global scale, which promote the cross-border; inter-provincial and cross-sector logistics industries have become more and more sophisticated and effectively promote the prosperity and development of the social economy. In addition, the large-scale combination of electronic commerce field and logistics field is promoting the information technology becoming the core of modern logistics. While as the logistics information platform is the extension and support of information technology, which makes it necessary to construct the information platform.<sup>[5]</sup>At the same time, Hubei Province as the central Province, both the rise of central China and the western development strategy are promoting the fast growth of its economy, this rapid economic growth has attracted many foreign-funded enterprises invested in Hubei Province. As of November 2011, there were 91 enterprise of the world's top 500 have been settled in Hubei and this new economic situation promote Hubei Province must constantly improve the development of its modern logistics industry. Although it has more than 3000 logistics enterprises, large-scale logistics enterprise only account for a quarter of the total number and the number of 3A-class logistics enterprise only 18. Therefore, in order to meet the current needs of the economic development, Hubei Province must establish a safe, reliable and efficient logistics system. To change the current shortcomings in the management of the logistics industry such as small scale operation, low morale of logistics workers, single service function and scattered logistics markets. All of these have forced it to establish a logistics and public information sharing platform to meet the current economic development trend of the logistics industry. And through this platform to integrate the existing logistics resources in the Province, to share the existing resources and give full play to the whole advantage of logistics industry in Hubei Province. Table 4 shows Hubei Province's logistics industry added value, total GDP and the proportion of logistics industry added value in GDP from 2006-2010.

**Table 4 Logistics Industry Added Value, Total GDP and the Proportion of Them from 2006-2010**

Years	logistics industry added value (one hundred million Yuan)	GDP (one hundred million Yuan)	the proportion of logistics industry added value in GDP
2006	542	6590.19	8.22%
2007	660	7617.47	8.66%
2008	799	9333.40	8.56%
2009	903	11328.89	7.97%
2010	1100	12961.10	8.49%

From the table we can see that from 2006 to 2010, the GDP of Hubei is keep rising, but the

proportion of logistics industry added value in GDP change little. This situation limited the economic development, because the logistics industry as a pillar industry of a region's economic growth, its ability to rapid growth directly impact on the region's economic development. According to the present economic growth momentum in Hubei Province, we must change the underdevelopment status of the logistics industry, to increase the proportion of logistics industry added value in the Province's GDP and help it to establish a high level logistics and public information sharing platform to solve the series of problems.

Environmental necessity: for a long time, under the influence of the traditional idea, we pay more attention to the production and development but less emphasis on circulation and environmental protection, which put pressure on our environment and resources, especially in the high-speed economic growth situation. To develop the modern logistics and construct the logistics and public information sharing platform, use modern technology and management methods to integrate various types of logistics information resources, processing, treatment, and then sharing, this can significantly reduce the cost, reduce the rate of empty card rove back and circuitous transport, and reduce the road congestion, emissions and vehicle's fuel consumption. To achieve the transformation of economic growth and improve the management quality and efficiency, at the same time, promoting the development of low-carbon economic social. In addition, the logistics and public information sharing platform can greatly improve the efficiency of the logistics operations. Though the level of information to speed up the documents passing of goods, improve enterprise management level and management efficiency, and to improve cargo security, reduce errors, improve the tracking efficiency of goods and the transaction rates of goods vehicles. At the same time, thanks to the high correlation of modern logistics, which makes all industries that closely related to it such as machinery manufacturing, circulation, postal communication, information services and infrastructure construction have a new development space. Thus, in the new century, as people pay more attention to the conservation of resources and the protection of environment, it is badly in need of establishing a logistics and public information sharing platform to promote the upgrading of the traditional logistics industry and the adjustment of Hubei Province's economic structure.<sup>[3]</sup>

Government necessity: to government departments, logistics and public information sharing platform are also very useful. Late start due to the development of modern logistics in Hubei Province, a lot of logistics enterprises were transformed from traditional transportation and storage enterprises, which makes it very difficult for the government to unified manage and planning them. Through the logistics and public information sharing platform, government departments can directly to manage the logistics companies, can fully grasp the operation status of the logistics market and found its inadequacies, and supervise to improve and control the logistics status. And through this platform also can overall control the logistics market, such as the implementation of online tax returns and management and to supervise some online business. Therefore, the government is in special needs of a logistics and public information sharing platform that can provide multi-service for it, not only to provide services for logistics companies, but also help the government to plan modern logistics development strategy and make modern logistics development policy, and it has an important significance to perfect and develop the modern logistics development of Hubei Province.<sup>[6]</sup>

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# A Study on the Materiel Supported Logistics Informatization Evaluation

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**Abstract:** Based on the current system evaluation technology and the special characteristic of materiel supported logistics informatization, this paper gives us three methods about analysis of materiel supported logistics index and systematically analyses the modeling principle of the items of MSLI and proposes system evaluation architecture. This paper also provides some guidance methods for the evaluation of armed MSLI. At last, the components of materiel supported logistics informatization evaluation system are analyzed in detail.

**Key words:** Materiel; Informatization; Items; Evaluation Management System; Evaluation

## 1 Introduction

In China, it is put forward definitely that “vigorously promoting the national economy and social informatization, using informatization to promote industrialization as well as making the most of the late-development advantage to realize great-leap-forward development of social productive force”. On October 9, 2002, Ministry of Information Industry of China firstly takes out the informatization index system for the benefit—“The Basic Index Structure Program of Enterprise Informatization (try out)”, which provides an evaluation foundation and standards for the comprehensive assessment of all kinds enterprises’ information development and application level in China.

For scientific and effective informatization construction, it is necessary to establish a reasonable, efficient and realistic information evaluation index system, according to the statistics, analysis and evaluation of index system data, to lay the foundation for full understanding of the actual situation of materiel supported informatization construction of logistics and provide guidance to materiel supported informatization construction of logistics. Digitization, automation, network, integration, visualization and intelligent of the information management should be gradually realized, and environment of integrated data management should also be built, to realize the whole system, whole process and comprehensive management and monitoring of materiel supported resources as well as provide accurate, fast, and timely information service and scientific basis to guarantee the decision making, so as to realize the “accurate foresee security”, improve the management efficiency and benefits and effectively improve materiel supported the logistics capability and comprehensive management level as well as adapt to needs of the materiel modernization development.

This paper is based on the actual situation of the materiel supported informatization construction, around the aim to improve the management level and guarantee ability of materiel support, according to existing scheme; we put forward a set of basic indicators for materiel supported logistics information.

## 2 The Base of Materiel Supported Logistics Information

Information must firstly include advanced information materiel; secondly the use of advanced information technology for development and utilization of information resource must be included. The two should become the core of information. Because, firstly only by relying on the advanced information materiel to change the traditional pattern of manual operation can it be possible to talk about the high efficiency of information and knowledge production and use; secondly only by high efficiency of information and knowledge production and use can it go up to the knowledge economy, social information economy development. Information is a dynamic process; information is not only a technological revolution, but also a profound understanding revolution and social revolution.

Construction of informatization safeguard of materiel logistics is point to the applying of a series of general modern information technology in the materiel supported logistics, such as computer technology, network technology, database technology, artificial intelligence technology, automatic technology and so on. By deep development and the general use of the materiel supported information resources, the managerial degree of the materiel intensification, together with the reliability and maintainability of the materiel supported as well as the efficiency and level of the management and decision-making should be



improved constantly, so as to improve the economic benefit and combat effectiveness of materiel supported.

### **3 Analysis of Materiel Supported Logistics Index**

In order to get effective index of system evaluation, it is necessary to establish a set of complete and systematic index model system. On the base of study in the structure of the evaluation index system, a variety of methods are used to gain the data of index system and establish hierarchical structure of the quantitative model of the system index, and then to calculate the whole system index with suitable comprehensive evaluation model, at last the results can be applied in decision analysis for decision makers.

#### **3.1 Analysis of materiel supported logistics index**

Materiel supported logistics system is a huge system which is open and complex. The only effective treatment of this system is the qualitative and quantitative method. Quantitative measure is more complex than qualitative measure, but qualitative measure is the basis of quantitative measure, which means that qualitative measure mainly starts with the concept and nature of study object, analyzes the problem by quantitative reasoning and describes the nature of the problem, to lay a solid foundation for further quantitative measure; in actual research process, it often combines the qualitative measure with the quantitative measure, making them complement each other to complete the measure evaluation work of the study object.

Index is the comprehensive signs of measuring the overall goals of system. The index system points toward an organic whole composed by a series of indicators in the evaluation activity, which is a set of scales to measure the evaluation objects. Now, using the method of index system in comprehensive evaluation is widely-held in the social, economic and management sciences for system analysis.

Because of complexity and difficulty of materiel supported logistics informatization evaluation research, the evaluation research should follow the principles that the system should be from senior to low as well as from complex to simple, and the system should be researched by the method of dividing with stratified thinning. Index determination needs to make repeated balance in the dynamic process, some indicators need to be decomposed, and some other indexes need integration or deletion. About the basic methods of index determination, there are three kinds as the following:

##### **3.1.1 Survey modification method**

This is the most general method, in which preliminary draft of index set is drawn up at first by the special experts group, then to widely consult opinions of users, experts and superior leadership on all sides, at last decision is made after the repeated modifications.

##### **3.1.2 Top-down design method**

In this method, first analysis is used to determine the function of the system from the given task as well as determine the measure of system, and then to make evaluation of feasibility, in the end feedback is still needed. The top-down process is dynamic and constantly improving.

##### **3.1.3 Adaptive approximations method**

In adaptive approximations method, firstly index is drafted by the personnel who are responsible for system analysis and evaluation, and the experts who design system and use of units are also invited to bring forward amendments, then to establish the evaluation model after amendments and make modification on the base of the assessment and with reference to the test results of the past, after repeated modification, the final determination of index system structure can be made.

#### **3.2 The standards of materiel supported logistics informatization index system**

The design of materiel supported logistics informatization index system takes "way of entering into system organically" as principle, and materiel information should have global visualization as well as be fast and accurate, so as to make materiel supported informatization cooperate with overall information construction strategy; guide materiel supported informatization established on the basis of benefits, utility, overall planning and sustainable development; make sure the leaders correctly understand and organize the informatization implementation of the work unit.

In line with the following principles to design the materiel supported logistics information evaluation index system:

##### **3.2.1 Testability**

Testability is point to mark quantity of the index. It means that index can be obtained by the method such as the mathematical formula, test instrument, test statistics, etc.

3.2.2 Completeness

Completeness refers to the fact that all indexes which influence performance of the system should be concentrated in the index; collection of index should be extensive, comprehensive and universal.

3.2.3 Independence

Independence means that the index should be irrelevant, and in the system the cross should be reduced, with relative independence.

3.2.4 Objectivity

Objectivity means that the index can reflect the characteristics of the system, and can't vary with each individual.

3.2.5 Sensitivity

When the parameters of system's index change, the performance of the system should response to the change accordingly.

3.2.6 Consistency

Index should be easy to understand and accept as well as easy to form the common language of the study.

3.2.7 Maneuverability

Index should be linked up with existing data as far as possible, and the required new indexes should not only be clearly defined, but also be facilitated for data collection.

3.2.8 Continuity

The design of index system should not only continue in time, but also develop in the content.

**3.3 Index equipment safeguards logistics informatization**

From the aspects of leadership, strategic index, application, benefits, human resources, information security and other aspects, we put forward a set of indexes which are applicable to the objective description of each unit's normalization condition, mainly for the statistical investigation, monitoring and performance measurement. Specific index see table 1: the comprehensive index of the system can be received from weighted index for dimensionless of total index, and it reflects the degree of equipment's safeguarding informatization construction. The specific calculation of weight can refer to the expert scoring method, analytic hierarchy process and fuzzy evaluation method, etc. The decision of the method is in combination with the policy guidance. Due to the limited length, the below table is a rough guide list of level 1 and level 2 indexes for the equipment support logistics information evaluation index system.

**Table 1 Materiel Supported Logistics Informatization Evaluation Index**

First –class index	Second –class index	Constitution of index data
Strategic position	informatization importance	the top leader's position of the informatization work, information planning and budget formulation
	management system	the situation of making informatization management rules, management idea, management model, the control method, management mechanism, the management foundation, business process, organizational structure's obvious improvement and promotion
Infrastructure	the department computer quantity	large , medium and small computer, server, switchboard, workstation and personal computer
	network performance level	export of broadband network
	computer network rate	the rate that computers are connected to the intranet
	information automatic acquisition rate	informatization means that used for acquiring materiel supported logistics data and other resources information
Application situation	office automation system	whether to realize the schedule, receive text management and release information as well as deal with electronic mail, tracking and monitoring of information process, etc.
	the decision informatization level	whether there're data processing system, scheme of prior system, artificial intelligence expert system, etc.
	key business processes	the coverage and quality level of management informatization of main business process
	website construction	the coverage of service object, together with level and content of available service

	network utility ratio	online application rate; online transceiver rate; information sharing degree
	management informatization utility ratio	coverage rate and integration level of management informatization data; whether basic data is timely and effective, and whether its accuracy rate is above 95%
Human resource	informatization skill popularizing rate	the proportion of professional application technical personnel and coverage rate of non-professional informatization training
	electronic level of the study	coverage rate of electronic learning personnel, available degree in the area of studying electronic learning
Security	informatization security measures	information backup, illegal invasion prevention, anti-virus, information security system and cultivation of safety consciousness as well as status of measures application
	the proportion of the informatization investment used for information security	information security cost includes software, hardware, training and human resource spending
Efficiency index	materiel supported logistics guarantee efficiency	efficiency and satisfaction of all the materiel support activities
	materiel transceiver system	time that materiel transceiver is treated by the information system, situation of optimizing resource allocation and transfer
	equipment statistical speed	the shortest time that is needed by a full virtual final account from the statistics instructions' being sent to being completed
	growth index	the reliability of the information system; it is used to evaluate the main economic index of the materiel supported logistics capability and manage the assessment index during the process

#### 4 Structure Design of Materiel Supported Logistics Informatization Evaluation System

According to our research, materiel supported logistics informatization evaluation system is mainly combined with expert system which is an intelligent computer program system to design.

The internal part contains a lot of knowledge and experience of experts' level and can use the human experts' knowledge and methods to solve the problems of the domain, that is, the expert system is a program system which has a large number of specialized knowledge and experience, and it uses artificial intelligence technology and computer technology, based on the knowledge and experience provided by one or more experts of a domain, by reasoning and judgment to the decision-making process of human experts is simulated, so as to solve the complex questions those need human experts to be processed. The system can be divided into the following subsystems, which can make it better to describe system structure. The structure diagram of system evaluation is shown in figure 1.

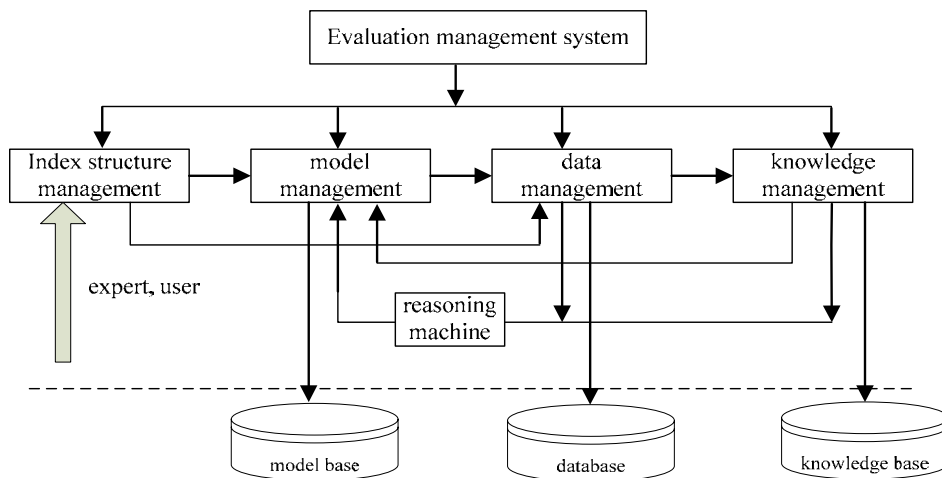


Figure 1 Materiel Supported Logistics Informatization Evaluation System

EMS (evaluation management system) is the top management of evaluation system. The content of the evaluation management includes index system management of equipment support logistics information system, comprehensive evaluation algorithm management, comparative analysis and parameter sensitivity analysis.

#### **4.1 Item structure management**

Index management subsystem establishes reasonable evaluation index system structure according to the users' requirement to the material supported logistics informatization system evaluation, and it which is the most important part of the evaluation process lays a foundation for evaluation management. The subsystem is responsible for not only the establishment, modification and adjustment of the index level structure mode, explanation of each index and acquisition standards of the quantized data, but also the data communication with model management system; the right model is used to quantify index data.

#### **4.2 Model management**

The management subsystem model is mainly responsible for not only the management of the model, but also exchanging information and data with other management subsystems. It can obtain data from database or dialog interface of man machine. Evaluation management subsystem calls reasonable model according to the index system determined by index structure management subsystem, and it also starts the synthetic evaluation of system. It can also turn some half structural model problems into structural model problems and management them.

#### **4.3 Data management**

Data management system is used to manage a variety of data of the entire measure index. It is used to store initial data of areas or the questions and intermediate data information in reasoning process that is the current fact of the processed object. It also includes the illustrative knowledge of the specific problems which have been solved and the current state of the problems needed to be solved.

Its main functions include database management which provides the data exchange interface between database and model library as well as offers performance data to performance management subsystem and finally feeds the rationality analysis of the model evaluation results back to calibration management subsystem.

#### **4.4 Knowledge management**

Knowledge management subsystem is mainly used in the knowledge management work, and knowledge base includes two parts. One of its parts is the information related with current model base and database; the other part is general knowledge and domain knowledge that is used in reasoning process. Most of knowledge represents rules, network, process and other forms. Knowledge base is used to store the special knowledge of expert system in a technology field, including the fact, the feasible operation and rules. In order to establish knowledge base, we must solve the problem of knowledge representation and knowledge acquisition. Knowledge acquisition includes how knowledge engineers get special knowledge from experts; knowledge representation is to solve how to express and store knowledge in the forms computer can understand.

Specialized knowledge and experience of expert system are very important in knowledge base. The key to success for expert system is whether we have a vast amount of knowledge, so knowledge representation becomes the key of expert system's design. In the level of control program, we must decide that which knowledge in knowledge base should be used according to the control strategy and the nature of the problem. The control strategy here is reasoning method. According to whether probability information is required, the fuzzy reasoning or accurate reasoning is decided to be used.

#### **4.5 Reasoning machine**

Reasoning machine uses the memory rules and the control strategy of the program to control the reasoning process, coordinate runtime knowledge calls and have the reasoning ability for many different options in model and the hypothesis, or different state in time. Reasoning machine can reason and draw a conclusion according to the knowledge, rather than the simple search of ready-made answers.

The expert system based on the model has used the model reasoning method. The reasoning method based on the model reasoning according to the model which reflects the internal rules of the objective world. There are a variety of models available to use, such as all parts of system components; the whole structural relationship model; hierarchical model that expresses level relationships, function model that expresses all parts' function and performance, causal model that expresses the causal relationship of all parts and so on. Of course, model based reasoning can only be used in the fields where model is available.

Systematic notion should be used in materiel supported logistics informationization system evaluation; it should be the organic synthesis of each subsystem rather than simple combination. It

should synthesize each subsystem organically rather than simply combination. It also should have satisfactory viewpoint, and materiel supported logistics informationization system is a complex information system, while the proper and optimum system concept doesn't exist in math, so what we should do is to find a satisfactory system and feasible solution. The method of materiel supported logistics informatization system evaluation still needs further research. Over the next years, statistical knowledge should be used in calculating the statistical data and evaluating the results to further test the evaluation model and further analysis on how different index factors have effect on information construction.

## 5 Conclusion

Based on the current situation of materiel supported informatization construction in China, the paper systematically uses three methods, combining with its eight principles to summarize the contents of materiel supported logistics informatization evaluation index which is subdivided based on first and second index. At last, materiel supported logistics informatization evaluation system is given, which is useful for relevant assessment, so as to improve the management level and guarantee ability of materiel support.

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## Research on the Construction of Competence Model about Network Businessmen

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**Abstract:** Many activities in organization are based on the person's competence, so competence has become an important factor to impact personal performance and organizational benefits. Development of competence has become an increasingly important issue. This paper used network businessmen as the research objects, and adopted the methods such as behavior event interview, questionnaire investigation, and content analysis to structure the competence model of network businessman. The results of this paper revealed the competence of network businessmen, and on the basis of competence model of network business, this paper provided a foundation for the improvement of network businessmen's performance.

**Key words:** Network Businessmen; Competence; Competence model; Factor analysis

### 1 Introduction

Since the concept of competence was proposed in 1970s, many academic researches and applications looked as a central issue and foundation in HR management. In terms of the competence research, an ample of evidences and experiences about competence were harvested in foreign country. Relatively, the researches about competence in China were fewer. Especially, little study was found in.

With the mutually popularizing of Network and the speedy propagation of information, Electronic Commerce have already formatted an importance strength for the current economic development. The businessman who used of Electronic Commerce to carry out business operations is called network businessman. According to the statistics, in 2007, Chinese C2C e-commerce market deals reached 51.8 billion, and in 2008, C2C markets deals had already exceeded 100 billion. This data is expected up to 4,000 billion in 2011. Also, the users of Chinese C2C e-commerce market in 2007 had reached to 48 million, and the total users had reached to 126 million in 2011. It can be seen that network businessmen is a huge groups which has a significant growth prospect.

The competence model will be varied in different culture and different industry. So the foreign competence model was not compatible for the Chinese cultural environment. The research about the competence of network businessmen is in blank space in current academic circles. This paper led the idea of competence management into network businessmen, enriched the theory system of competence. The effect was also beneficial to build the behavior regulations about network businessmen, and realized the effective management of network businessmen.

#### 1.1 Theory connotation of network businessmen's competence

This paper summarized various scholars views about the connotation of competence, summed up the meaning of competence as the following aspects: firstly, competence is closely to performance, and competence can identify between different performance; Secondly, the characteristics of competence are closely connected with work situations, namely, different work situations require different competence; Thirdly, individual competence has different administrative levels; Fourthly, individual competence level can be measured and evaluate objectively.

All in all, network businessmen's competence can fully reveal the high or low level of their competency elements, and is the critical success factor causing high-level work performance of network businessmen. Research on network businessmen' competence, is not only the overview and summary of the success about network businessmen's work from the work practice, but also can guide the future work of the network businessmen through competence research.

#### 1.2 Research significance about network businessmen' competence

In this context, research significance about network businessmen ' competence is particularly notable, mainly manifested in the following aspects:

Firstly, network businessmen has become an important booster of economic growth. In recent years, the rapid development of the Internet economy and E-commercial market has been expanding rapidly. So network businessmen has become an important force of China's economic development;

Secondly, network businessmen require scientific evaluation and guidance. The purpose of competence research is to find the core competencies which can distinguish different performance, which

competencies are directly related to network businessmen's performance; Thirdly, there is lacking of the representative competence model about network businessmen currently. So it is difficult to improve network businessmen ' performance through using competence model. Network businessmen are an emerging group. There are just a dozen years from their emergence to development to today, and their development is accompanied by the growth of Internet industry. Therefore, systematic and in-depth research on network businessmen ' competence, can enrich the competence theory in the domestic and foreign research field, and become the foundation about competence-building theory of network businessmen.

## 2 Analysis about Network Businessmen's Competence Characters

This paper choused network businessmen as the study object, and adopted the methods such as behavior event interview, questionnaire investigation, and content analysis to structure the competence model of network businessmen. This dissertation choused 27 network businessmen, and carried on in-depth interviews. Through the output of interviews, we obtained the Competence Dictionary and the Competence Characteristic Questionnaire about Network Businessmen. According to the interview result and applying the Competence Characteristic Questionnaire about Network Businessmen, carried out questionnaire investigation, and gave out 180 questionnaires.

### 2.1 Acquit ion of network businessmen's competence characters

Network businessmen ' competence characters were acquired mainly through behavioral event interviews of network businessmen.

Interview content mainly involved the key competence characters which can impact work performance. Seen from the industry, network businessmen should have the capacity to accept new things, and be good at grasping the opportunities; From the working content of network businessmen, they should have the interpersonal capacity and communication skills with customers; Judging from the characteristics of the network economy, network businessmen also have a certain network operations expertise and grasp special knowledge about network economy.

Overall, the result of interview showed that the characteristics which affect network businessmen's performance are the following main areas:

(1) **Market awareness:** the capacity to analyze market environment in the face of competitive pressure and the ability to make change, including seizing opportunities, information gathering, information explanation, observation ability, innovation, acceptability, reverse thinking, breakthrough tradition;

(2) **Interpersonal skills:** coordination skill in dealing with various relations and of resources, including the ability of repute, public relation, communication skill, social awareness, teamwork, altruistic behavior, organizational awareness, compliance and so on;

(3) **Personal influence:** mainly is one's own character and behavior, including fairness, objectivity, integrity, honesty, tolerance, reliability, attention to quality, attention to order, following rules, strategy, responsive, creativity, sense of efficiency, and so on;

(4) **Management leadership:** including organizational skills, management ability, decision-making, self control, command and management, achievement-oriented, awareness of rights, clear development goal, challenges and so on;

(5) **Professional skills:** including technical expertise, knowledge, self-education and so on.

### 2.2 Variance analysis of network businessmen's competence characters

Due to the particularities of Network industry, network businessmen should also have its specific competence corresponding to this industry in addition to general competence. According to the result of survey, we analyzed the variance analysis between competence and performance.

s the following table 1

**Table 1 Variance Analysis between Competence and Performance**

Competence	F	Sig	Competence	F	Sig	Competence	F	Sig
Respond quickly	11.425	0.001	Communication skill	8.237	0.005	Upward mobility	11.123	0.001
Strategic thinking	11.425	0.001	Sense of achievement	6.706	0.011	Capturing opportunities	10.259	0.002
Convincing	4.587	0.034	Public-relation ability	6.734	0.011	Overall-situation awareness	5.329	0.023
Social awareness	4.042	0.047	Decision-making capacity	10.501	0.002	Sense of trust	15.757	0.000
Personal prestige	14.300	0.000	Accept new things	13.067	0.000	Responsibility	11.632	0.001

Organizational capacity	9.279	0.003	Breaking through traditional	10.765	0.001	Continuous learning	9.212	0.003
Service awareness	22.373	0.000	Innovation ability	17.368	0.000	Observation skill	12.531	0.001
Team collaboration	35.346	0.000	Understanding	14.019	0.000	Sense of efficiency	13.194	0.001
Emotional stability	5.343	0.023						

From the result in table 1, there are 25 competence characters which significantly correlate with their work performance. Excellence performance groups and common performance groups are different significantly in responded quickly, communication skill and so on (significance level 0.05).

### 3 Construction of Competence Model of Network Businessmen

On the basis of variance analysis, exploratory factor analysis helps us to construct competence model of network businessmen. Firstly on first inspection, we do a KMO appropriate test and Bartlett ball test on important competency data. The result indicates that this data is ideal for factor analysis. Result is in the table 2 below:

**Table 2 KMO Appropriate Test and Bartlett Ball Test**

Bartlett	KMO	.787
	$\chi^2$	1073.909
	df	300
	Sig.	.000

Application of principal component analysis method, this paper finally extracted 7 factors which characteristic value is more than 1, and their cumulative explained variation is 60.79%. The result is in the table 3 below:

**Table 3 Principal Component Analysis**

Factor	Total explanatory variables			Factor loading		
	Total	variance	Communality	Total	variance	Communality
1	6.486	25.946	25.946	6.486	25.946	25.946
2	2.175	8.701	34.647	2.175	8.701	34.647
3	1.675	6.700	41.347	1.675	6.700	41.347
4	1.407	5.628	46.974	1.407	5.628	46.974
5	1.242	4.967	51.941	1.242	4.967	51.941
6	1.116	4.465	56.406	1.116	4.465	56.406
7	1.096	4.384	60.790	1.096	4.384	60.790

According to the result of factor analysis, competence characters which contain in factor 1,2,3,4,5,6,7 are concentrated, so we attempt to name and summary each competence factor. The result is in table 4 below:

**Table 4 Network Businessmen’S Competence Model**

Factor	Name	Competence characters	Correlation
Factor 1	Social contact ability	Social awareness	0.942
		Communication skill	0.886
		Public-relation ability	0.889
Factor 2	Team spirit	Overall-situation awareness	0.530
		Sense of trust	0.538
		Service awareness	0.596



		Team collaboration	0.519
Factor 3	Achievement desire	Upward mobility	0.288
		Capturing opportunities	0.695
		Responsibility	0.622
		Sense of achievement	0.695
Factor 4	Creative thinking	Respond quickly	0.754
		Accept new things	0.600
		Breaking through traditional	0.338
		Innovation ability	0.597
Factor 5	Individual influence	Strategic thinking	0.756
		Convincing	0.571
		Personal prestige	0.550
		Sense of efficiency	0.116
Factor 6	Management and leadership ability	Continuous learning	0.811
		Organizational capacity	0.270
		Decision-making capacity	0.342
Factor 7	Interpersonal perception	Understanding	0.764
		Observation skill	0.452
		Emotional stability	0.211

The result indicated that the competence of network businessmen was composed of seven kinds of factors, such as social contact ability, team spirit, accomplishment desire, creative thinking, individual influence, management and leadership ability, and interpersonal perception.

#### 4 Conclusion

On the summary of the past research results related to competence and competence model, this paper used behavioral event interview and questionnaire method, established the competence model of network businessmen, and provided an objective basis for the improvement of network businessmen's performance.

The competence model of network businessmen constructed in this paper will extend the range of competence research to the group of network businessmen, improve the level of theoretical study of network operators, and promote the performance of network businessmen. It is hoped that network businessmen should develop more orderly and more efficient on the basis of competence model in the future.

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# Analysis on the Yacht Interior Outfitting Modular Partition Design Method\*

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**Abstract:** Yacht interior outfitting of modular design is an effective method for the yacht manufacturing enterprises to realize the mass customization of yacht interior outfitting, and it is one of the important research directions of yacht. The division of Yacht internal outfitting module is the basis of implementing yacht interior outfitting modular design. The scientific system of modular division can ensure the effective implementation of the modular design and organization of modular production. So study of yacht interior outfitting modular theory, analysis of the basic characteristics of interior outfitting of module partition, and inductive yacht interior outfitting module partition method, are the base of study for modular design in yacht interior outfitting.

**Key words:** Modular; Principle of partition; Partition method; Enumeration method

## 1 Introduction

As an individual consumer product, yacht reflects the user's social status, aesthetic, values. Yacht interior outfitting as the direct interaction interface of yacht and users, is an important part to embody the style and quality of yacht. Different users according to their own aesthetic and value orientation will choose different styles of interior design. Yacht interior outfitting is a complex system, including infrastructure unit (hydropower unit, pipe unit), decoration unit (a furniture unit, wall unit), functional unit (cabin unit, health unit, kitchen unit). Mass customization production model extends the shipbuilding cycle. Using non standardized components makes it difficult to ensure the quality of yacht interior outfitting.

At present domestic yacht interior outfitting is a kind of multiple variety and small batch engineering. Yacht modular design is still in its primary stage, lacking scientific system research of modular theory. The research of yacht interior outfitting module partition method is more deficient. Modular design of yacht interior outfitting is an effective measure to solve the contradiction between yacht outfitting diversification demands and mass production. The research of yacht interior outfitting module partition method is the premise to achieve the yacht modular manufacturing. Yacht mass customization mode is the development direction of modern yacht design. In recent years modular design concept began to transform from naval to civilian ships. In the engineering application aspect, modular design is mainly reflected in the system module partition, module combination, and the use of standard modules between series and even cross series products. This enables a module to be involved in the series products, and then form the diversification of products to meet customer's demand for product diversification<sup>[1]</sup>. The modular design realizes the complex system transformation from the personalized products to the serialization of products, reduces product development costs, shortens production cycle, improves production efficiency, and meanwhile makes the later product maintenance, update, recycling, and recreation more convenient. The purpose of the module partition is to realize the mass production of module based on the high-efficient operation of yacht interior outfitting engineering. Scientific system of module partition can greatly improve the production efficiency, reduce the yacht outfitting costs. Meanwhile independent modules can facilitate the standardization, generalization, and series in design, then promote module's batch and planned production<sup>[2]</sup>. Module partition requires consideration of the limits in production conditions, structural strength, processing technology and other aspects. It is integrated design engineering.

## 2 The Basic Characteristics of Yacht Interior Outfitting Module Partition

### 2.1 The influencing factors

The yacht interior outfitting has its own characteristics compared with Ordinary home decoration

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and the large ship interior decoration. Yacht interior outfitting has relatively narrow space, at the same time it needs to meet the demand of the user's (owner) aesthetic and its function. Designers need to comprehensively analyze the space, materials, technology and other aspects, and then make the reasonable layout and module partition of Yacht interior outfitting.

## **2.2 Five characteristics of Yacht interior outfitting module partition**

### 1) Identity of module partition

Yacht interior outfitting system includes: pipe system, power system, communication system, wall unit, furniture, sanitary unit, etc. For these systems and unit division, the yacht interior outfitting module partition should follow the identity of module partition, accordingly the divided sub-modules need to be classified into the same type of module library in the partition for the same unit. This division can facilitate the management, update, replacement and the new development of the module.

### 2) Adaptability of module partition

The module level needs to be considered in module division. Module is a relative concept. Each module can be divided into several smaller modules, with the smallest module as the unit member. In the module partition, we need to take the adaptability of module partition into consideration, and make the reasonable division of system-matching module according to the limiting factors such as difficulty in different module productions, module size, and module weight. Rational module partition can greatly improve the yacht interior outfitting module manufacture, installation efficiency; guarantee the precision and quality requirement of interior decoration.

### 3) Independence of module partition

The division of the module changes the complex systems into a relatively simple design unit. Each divided module is able for independent design and manufacture<sup>[3]</sup>. Since modules change into relatively independent units, in collaboration with the general interface finally we can complete the overall interior outfitting production. Independence of module partition can ensure the success of concurrent engineering in design of yacht interior outfitting. Meanwhile, under production condition restrictions, independence of module partition enables the module production to be assisted by module outsourcing or off-site coordination.

### 4) Operability of module partition

Limiting factors such as plant, hoisting, production, installation and other production conditions need to be considered in module partition. Divided module must meet the hoisting equipment practical ability, so as to avoid unnecessary accidents in production. At the same time, the degree of difficulty in installation and manufacture should be taken into account, so that over-complex modules can be simplified as much as possible to reduce the production difficulty. Only with full consideration to the actual production conditions can a more reasonable modules form be designed in the existing conditions.

### 5) Economy of module partition

Module partition on one hand is to meet the demand of mass customization, and on the other hand save the cost of the enterprise. The economy of module is a comprehensive embodiment, including manufacturing costs, maintenance costs, and the bulk of the cost effect. Yacht interior outfitting system in the module partition needs comprehensive analysis from the overall situation to help the yacht enterprise obtain the biggest economic effect.

The above are the basic characteristics of the yacht outfitting modular partition. These characteristics are helpful for modular design of the hull of the yacht or outfitting. Modularity is a general concept. Although only classification and split task needs may be different due to different backgrounds, in practice, it can be used to solve many design problems<sup>[4]</sup>. The characteristics of modular partition are the summarization of specific design practice and experiments. Only in these constraints of the characteristics, we can transform modular design into modular production practice.

## **3 The Modular Division Method of Yacht Interior Outfitting**

### **3.1 Analysis method of the modular division**

Yacht interior outfitting module partition method is related to the degree of module subdivision. Module partition is the foundation of the development of module series and module standardization. Referring other industry's method in the area of module partition is an important way for the research of yacht interior outfitting modular design, and it can provide a train of thought of yacht interior outfitting module partition. This paper summarizes several modular division method based on the basic characteristics of Yacht interior outfitting module partition.

### 3.2 The method of yacht interior outfitting modular partition

#### (1) The yacht interior outfitting modular partition according to region

In recent years, ship design has been developed to unify the shipbuilding form. With the ships' piecewise regional segmentation, which should be pre-installed, becoming increasingly bigger, the large ships' integration platform pre-installation rate is increasingly high, and the package enjoy ever higher modular degree<sup>[5]</sup>. There were some differences between the integration shipbuilding mode of large ships and the modular design of the yacht interior outfitting, but the modular division of the yacht interior outfitting could draw lessons from the respect of modular division. Using the method of modular division, the space of yacht can be divided into: the sitting room area, kitchen, driving control centralization, toilet, master bedroom, the crew bedroom, flying bridge active area etc. (as shown in figure.1). At present, the design of the module has developed to the one that is provided with independent toilet and accommodation modular unit<sup>[6]</sup>. The modules divided by region have the characteristic of independent space. Under the allowed conditions of hoisting and manufacturing, developing the modular block with independent space is the modular development direction. By hoisting the independent regional modules into the boat based on the hull, and then making the partition between regional modules, finally capping, we can finish up the pre-installation of most yacht interior outfitting, instead of putting great labor in the manual processing production of outfitting after sealing the hull. Thus efficiency of construction is greatly improved, and since much work is transferred from the hull to the ground, working environment of workers can be improved.

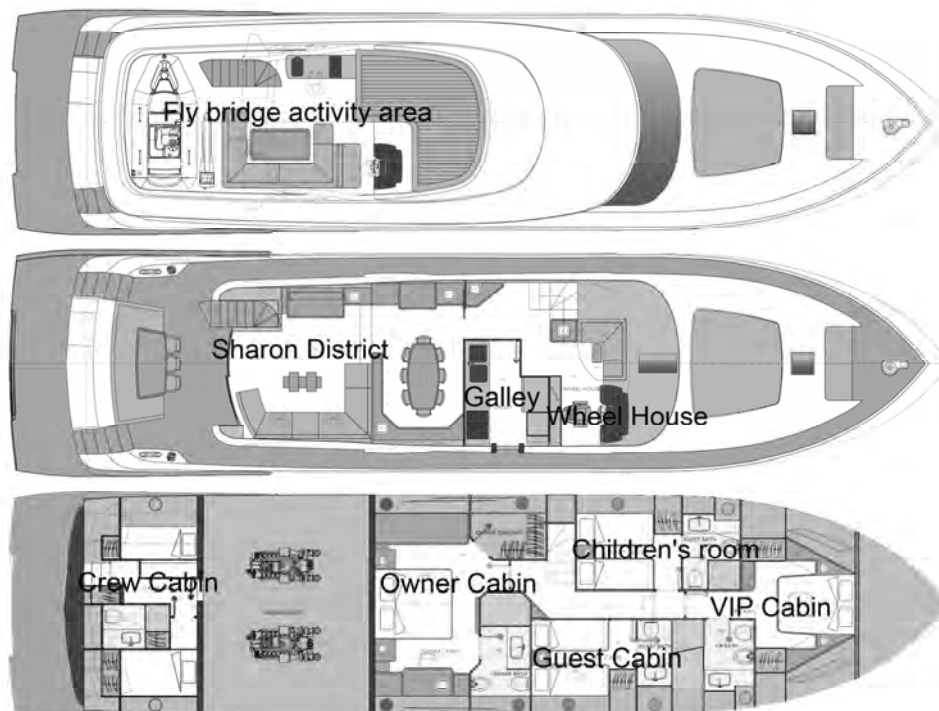


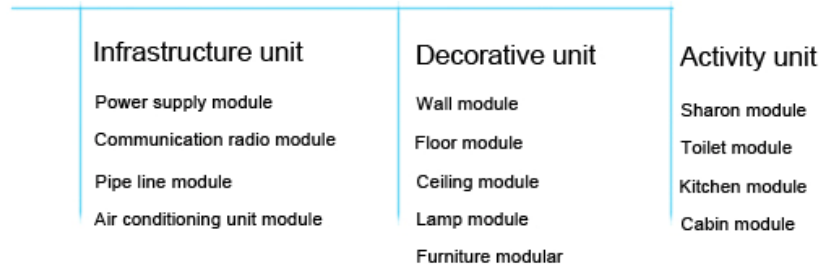
Figure 1 Blue Bird 78ft Yacht Layout Chart

#### (2) The yacht interior outfitting modular partition according to the function

The system engineering of yacht interior outfitting includes a large number of functional parts and function devices. These function facilities ensure the normal operation of the yacht interior outfitting. Dividing by function to decompose the yacht outfitting module is an effective measure of modular partition. According to function, the yacht interior outfitting can be divided into hydropower module, furniture module, floor module, toilet module, main accommodation module, lamps and lanterns module, air conditioning module etc.(as shown in figure.2). Such method of partition is not only convenient for the renewal and the maintenance of the later module, but also raises the profession of manufacturing and improves the quality of the module's quality. This way also facilitates the management of module

organization, thus ensures the smooth development s of yacht interior outfitting process. The modules divided by function could realize modules’ seamless installation through the spatial position, which greatly increased the completeness of interior outfitting. Function module is the basic form of the modular partition in yacht interior outfitting, and based on function module, the further research of modular partition can subdivide reasonable modular manufacturing ways better.

### Yacht interior outfitting system



**Figure 2 Yacht Interior Outfitting System Partition Graph**

(3) The yacht interior outfitting modular partition according to the variable parameter

The division according to the variable parameters is a method of module division on the basis of function or region division. The module unit is divided into a variable module, a fixed module, and semi autonomous modules. This division method serves for modular serialization and standardization of. For example, yacht interior outfitting teak floor module is a variable module. It can be divided into different modulus sizes according to different types of size and spatial dimension. Based on the standard module, the floor can be designed to be 2000\*2000 or 2000\*1000 basic unit size, and then the standard size module can be formed into a series of products, making next owner’s choice convenient. For another instance the toilet can be divided into a fixed immutable module, because no matter how the ship type changes, the demand of toilet for people in the compartment won't have big change. So toilet can be designed to a fixed standard module. This fixed module in different ship types or the same ship type series can be used in the cabin. Semi autonomous module means one that can change its size in local space when realizing link of the interface with other modules. Some of the interfaces of module is constant parameters, but in the other directions, changes can be made according to the design and need of the layout. For example, the living room cabinet module. The living room cabinets in the enclosure wall of the contact portion are not variable, but the cabinet width can be designed to different specifications and sizes according to the owner's needs. This module which can ensure fast installation also can change a different style for owner’s choice.

(4) The yacht interior outfitting modular partition according to the construction schedule

The yacht interior outfitting needs to set up a large number of embedded parts and installation of standard parts. The yacht interior outfitting modules can be considered in accordance with the construction progress of the modules, which is divided into: embedded module, integrated module and installation module. Embedded module includes electricity & water module, wood module and embedded module in the functional module. Installation needs to be laid in these modules to make follow-up module installation smooth, and unnecessary rework and waste of material should be avoided. Installation module refers to the attachment in hull surface beautification space adornment module. These modules include: smallpox module, floor module, wall module, etc. Combination module mainly refers to furniture module and kitchen module, etc. These modules only need to be hoisting aboard after completing the installation of the other modules. Forming the modules into different styles in the space according to the owner’s needs makes the layout of the cabin space more reasonable and beautiful. Module division according to the construction schedule makes the yacht interior outfitting module mounting in good order and well arranged in construction management. It brings great help to construction management greatly shortens the construction period of the yacht outfitting.

These classified methods are not isolated. They link closely with each other, so designers need to make the division according to actual situations. The designers should use these partition methods comprehensively to complete the entire yacht interior outfitting. It also puts forward higher requirements

of the designer. The designer needs to make overall arrangement of the entire process of modular design, production and manufacturing for yacht interior. Modular partition is not a fixed method. With the development of technology and improvement of the production condition, new, more reasonable method will appear for modular partition. But the common purpose of all the modular partition is to improve the yacht outfitting modeler, reduce the yacht's development cost, save labor and realize the upgrade of the yacht industry.

#### **4 Conclusion**

Yacht interior outfitting module partition determines the design, installation, construction technology and other production practice of the yacht module. It is the base of yacht interior outfitting design. Modular partition needs to be associated with the yacht enterprise's production capacity, sales, and marketing to formulate a modular partition method that meets enterprise's development goals so that the market competence of the enterprise can be enhanced. Rational module partition system can improve the construction efficiency of yacht interior outfitting, reduce the labor intensity of workers, and improve the working environment. By building the module database for partitioned module coding, and then forming a standardized, universalized and serialized module system, in the future development of ship type, people can select a suitable module to form a new interior outfitting module combination according to the owner's needs, and finally achieve the purpose of mass customization production for yacht interior outfitting.

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# The Efficiency Evaluation on Chinese Universities' Input-Output Based on DEA\*

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**Abstract:** This paper constructs the input and output indices system of Chinese universities' teaching departments. Taking one university in China as an example, it measures the comprehensive efficiency, technical efficiency and scale efficiency of the university's teaching departments based on the DEA model. The results show that teaching departments in the university are DEA effectively. For those are not DEA effectively, slack variables of the input and output indices are calculated by using DEA model, and puts forward some improvement measures.

**Key words:** DEA; Teaching departments of university; Input-output; Efficiency evaluation

## 1 Introduction

Recently, The Education Ministry of China claims in *The National Medium-and long-term Framework for Education Reform and Development* that 'the reform will be done in the following fields: management model, competition system, performance evaluation and dynamic management' and 'the regulation of the expenditure of education fund will be made'. In 2011, The Central Research Institute of Education and Science released the evaluation results of certain prestigious universities' performance, this makes all levels' universities realize the importance of performance evaluation whose results determine the annual distribution of education fund, which is made by the Education Ministry. The universities' four basic functions are: cultivating talents, conducting scientific research, serving the society and inheriting and passing down the culture. But the final executors are teaching departments in universities. Therefore, performance evaluation of the universities' departments determines the overall performance evaluation to a certain extent.

Data Envelopment Analysis (DEA) is often applied to the performance evaluation of universities. By using DEA, some researchers analyze the efficiency of input-output of the departments of universities' departments. Such as Cha Yong and Liang Liang (2004), Yin Junming and Wang Pingxin (2011), etc., they have analyzed the efficiency of input-output of some teaching departments of universities by DEA with designing different input and output indices. However, some problems still exist in terms of the construction of evaluation index system and the choice of indices. This paper aims at resolving these problems by applying DEA to measure and analyze a university's efficiency (we call it  $W$  in the paper). Particularly, we focus on the average comprehensive efficiency, technical efficiency and scale efficiency of the departments from 2008 to 2010.

## 2 DEA Model and the Construction of Index System

### 2.1 DEA model $C^2R$ and model $BC^2$

Firstly, we suppose that there are  $n$  DMU (Decision Making Unit) and  $m$  input variables and  $s$  output variables for each unit, and we utilize the vector:

$$X_j = (x_{1j}, x_{2j}, \dots, x_{mj})^T, Y_j = (y_{1j}, y_{2j}, \dots, y_{sj})^T, j = 1, 2, \dots, n. \text{ The signs } (X_j, Y_j) \text{ are used to}$$

symbolize  $DMU_j$ . By using Charnes—Cooper, adding free variables  $s^+$  and  $s^-$ , and introducing  $\varepsilon$ , we gain the following DEA model  $C^2R$ :

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$$(D_{1\varepsilon}) \left\{ \begin{array}{l} \min[\theta - \varepsilon(e^{-T} s^- + e^{+T} s^+)] = V_{D_{1\varepsilon}} \\ s.t. \sum_{j=1}^n X_j \lambda_j + s^- = \theta X_0 \\ \sum_{j=1}^n Y_j \lambda_j - s^+ = Y_0 \\ \lambda_j \geq 0, j = 1, 2, \dots, n; s^+ \geq 0; s^- \geq 0 \end{array} \right. \quad (1)$$

In the model,  $e^{-T} = (1, 1, \dots, 1) \in E_m$ ,  $e^{+T} = (1, 1, \dots, 1) \in E_s$  and  $\varepsilon$  is not Archimedes infinitesimal variable.

The model  $C^2R$  can be applied to measure the comprehensive efficiency of each DMU. The method is as follows: on the condition that  $\varepsilon$  is not Archimedes infinitesimal variable, the most possibilities of  $(D_{1\varepsilon})$  is  $\lambda^0, s^{-0}, s^{+0}$ , and  $\theta^0$ . If  $\theta^0 = 1, s^{-0} = 0$  and  $s^{+0} = 0$ ,  $DMU_{j_0}$  is effective.

At the same time, we apply Charnes—Cooper, add free variables  $s^+$  and  $s^-$ , introduce  $\varepsilon$  and add another supposition  $\sum_{j=1}^n \lambda_j = 1$ , we gain DEA model  $BC^2$ :

$$(D_{2\varepsilon}) \left\{ \begin{array}{l} \min[\theta - \varepsilon(\hat{e}^T s^- + e^T s^+)] = V_{D_{2\varepsilon}} \\ s.t. \sum_{j=1}^n \lambda_j X_j + s^- = \theta X_0 \\ \sum_{j=1}^n \lambda_j Y_j - s^+ = Y_0 \\ \sum_{j=1}^n \lambda_j = 1 \\ \lambda_j \geq 0, j = 1, 2, \dots, n \\ s^- \geq 0, s^+ \geq 0 \end{array} \right. \quad (2)$$

In the model,  $\hat{e}^T = (1, 1, \dots, 1) \in E_m$ ,  $e^T = (1, 1, \dots, 1) \in E_s$  and  $\varepsilon$  is not Archimedes infinitesimal variable.

The model  $BC^2$  is applied to the evaluation of technical efficiency. The procedure is as follows: on the conditions that  $\varepsilon$  is, the best possibilities of  $(D_{2\varepsilon})$  is  $\lambda^0, s^{-0}, s^{+0}$ , and  $\theta^0$ , and  $s^{-0} = 0, s^{+0} = 0, DMU_{j_0}$  is effective<sup>[1]P64-68</sup>.

**2.2 The measurement of input- output efficiency by DEA model**

The input-output efficiency of universities is reflected by the comprehensive efficiency which consists of technical and scale efficiency. Scale efficiency is measured by DEA model  $C^2R$ ; Technical efficiency is measured by DEA model  $BC^2$ ; Scale efficiency reflects that whether the units run in suitable investing scale. It equals to the comprehensive efficiency/technical efficiency<sup>[3]P98</sup>.

**2.3 The norm system for measuring input and output of teaching departments**

Universities are non-profit organizations which aim to achieve educational productive efficiency by putting various educational resources into personnel training, scientific researches, social services and cultural inheritance innovations. Educational resources are the integration of manpower, material resources and funds, including tangible and intangible educational resources. As it is apparently more difficult to measure them, this paper will not discuss about intangible educational resources. To sum up, measuring input and output in teaching departments should be based on the principle of ‘simplifying, highlighting and characterizing’, of which simply means the number of measurements should be reduced reasonably, highlighting some measurements appropriately, emphasizing and characterizing the



essence of measurements distinctly uncovered.

### 2.3.1 Input indices

The measurement of input contains three aspects. Firstly, it contains the input in manpower which includes teaching staff and supporting staff. This investment can be indicated by two indices:  $X_1$ , the number of teaching staff and supporting staff;  $X_2$ , salaries and welfare expenses spent on teaching staff and supporting staff. Clearly, these two indices are closely connected, but the former highlights the 'quantity' of manpower and the latter is the 'quality' of manpower (There is a big income gap between teaching staff and supporting staff who have different educational backgrounds and positions, therefore, which is an indicator of quality. Secondly, the input in material resources, i.e. the original value of teaching facilities including furniture and occupied housing, is indicated by  $X_3$ . Thirdly, funds, i.e. the funds spent on the administration of teaching departments and operating funds, contain three indices:  $X_4$ , public spending,  $X_5$ , scientific research expense and  $X_6$ , special business expense. The above six indices can be expressed by the vector  $X = (X_1, X_2, X_3, X_4, X_5, X_6)$ .

### 2.3.2 Output indices

Output index refers to the following aspects: 1) cultivating talents at all levels. This is reflected by two indices: one is  $Y_1$ : student' Jordan numbers; another is  $Y_2$ : revenue of various types' cultivating students; 2) the output of scientific research is reflected by three indices: one is  $Y_3$ : the comprehensive value of teaching (all teaching research will be transferred into certain value); second one is  $Y_4$ : the comprehensive value of scientific researches (all scientific research will be transferred into values); the third one is  $Y_5$ : the revenue from teaching and scientific research fund; 3) the output of serving society which comes from the services provided by the departments, such as consultation and transferring scientific research results, with index  $Y_6$  - social service income; 4) the output of inheriting and passing down culture which come from the activities attended by the departments, With  $Y_7$  - culture innovation achievement score (achievement of different levels is folded into a certain score, then aggregated). All the seven indexes are labeled by the vector  $Y = (Y_1, Y_2, Y_3, Y_4, Y_5, Y_6, Y_7)$ .

## 3 Methodology

In order to keep the secret of some statistic data, the university which we study is called W in this paper. It is a comprehensive university whose main purpose is teaching. It is one of the best universities with sixty years' history. At present, W has 16 teaching departments, among which there are twelve common departments, one department providing the same courses for all students, one department providing preparatory courses, one department providing courses for adults, and one department for vocational education.

### 3.1 The procedures for collecting data

In order to avoid the unnecessary variables, we choose twelve common departments in the input-output efficiency evaluation. Meanwhile, we also take the variable time span into scientific research for consideration. Generally speaking, one research takes 2 or 3 years. So we focus on the research from January, 1, 2008 to December 12, 2010. Each department is regarded as a DMU. Then, we obtain the following data in table 1.

**Table 1 The Average Input and Output of Twelve Departments of W (2008-2010)**

DMU	Input Indices						Output Indices						
	$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$	$Y_1$	$Y_2$	$Y_3$	$Y_4$	$Y_5$	$Y_6$	$Y_7$
DMU <sub>1</sub>	75	311	1251	161	65	120	1410	494	52	150	65	10	0
DMU <sub>2</sub>	50	193	860	143	42	85	828	390	48	128	42	5	6
DMU <sub>3</sub>	62	279	980	155	50	78	1180	448	80	168	50	2	0
DMU <sub>4</sub>	55	231	758	121	38	60	886	354	55	120	38	3	0
DMU <sub>5</sub>	78	273	850	195	45	95	1352	554	90	180	45	6	2
DMU <sub>6</sub>	56	199	480	143	45	75	908	445	30	90	45	10	0
DMU <sub>7</sub>	65	276	530	146	58	90	1040	541	62	115	58	3	0
DMU <sub>8</sub>	56	227	745	115	66	75	950	349	50	98	66	5	0
DMU <sub>9</sub>	64	310	558	182	42	80	1140	433	80	124	42	8	6
DMU <sub>10</sub>	66	307	675	175	53	60	1256	565	45	132	53	4	0
DMU <sub>11</sub>	58	276	858	160	45	55	916	385	65	86	45	8	4
DMU <sub>12</sub>	82	316	1350	234	85	120	1520	654	120	168	85	9	8
<b>Total</b>	<b>767</b>	<b>3197</b>	<b>9895</b>	<b>1929</b>	<b>634</b>	<b>993</b>	<b>13386</b>	<b>5612</b>	<b>777</b>	<b>1559</b>	<b>634</b>	<b>73</b>	<b>26</b>

**Note:** The able data are sourced in the financial statements of W.

**Table 2 Values of Comprehensive Evaluation of Teaching and Scientific Research of W**

Types	journal paper (unit: point)			book (unit: point)		honour (unit: point)					
	A	B	C	A	B	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>
teaching	10	5	2	30	15	100	80	50	30	20	10
research	10	5	2	30	15	100	80	50	30	20	10

**Note:** In table 2, A stands for the publications published by national publishing institutions. B and C stand for the publications published by non-national publishing institution. A<sub>1</sub>, A<sub>2</sub> and A<sub>3</sub> stand for honour rank first, second and third at national level. B<sub>1</sub>, B<sub>2</sub> and B<sub>3</sub> stand for honor and first, second and third at provincial level.

**Table 3 The Value of Comprehensive Evaluation of Teaching of W**

Type	best bachelor thesis		best master thesis		best courses			special thesis	
	provincial level	university level	provincial level	university level	national level	provincial level	university level	national level	provincial
teaching result	3	1	5	2	50	20	10	30	20

**Note:** Table 2 and 3 is a framework for the comprehensive evaluation value of teaching and research. There might be other frameworks for different universities.

### 3.2 Selection of input indices and output indices based on DEA

In DEA evaluation of input-output for W, due to the limitation of the number of DMU (teaching department of W), evaluation index of input and output should simple, otherwise it will affect the accuracy of the evaluation by the DEA model. Due to the classification of input indices and output indices, according to statistical analysis, we can calculate the correlation coefficient between input indices and output indices. The highest indicators of the correlation coefficient are selected as input indicators and output indicators. Correlation analysis shows that we choose three input indices and three output indices for using DEA model. They are X<sub>2</sub> (stands for the labour input), X<sub>3</sub> (stands for material input), X<sub>4</sub> (stands for the financial input); Y<sub>1</sub> (stands for the talent output), Y<sub>4</sub> (research output) and Y<sub>6</sub> (stands for the output of serving society). We do not take the index of cultural inheritance into account because its value is zero.

These data are processed by DEAP2.1. Firstly, we set the document introducing parameters: NUMBEROFFIRNIS for 12, NUMBEROFTIMEPERIODS for 1 year, NUMBEROFOUTPUTS for 3 year, NUMBEROFINPUTS for 3. We select the formula 0=INPUT ORIENTATED, 1=VRS, 0=DEA(MULTI—STAGE). Then we obtain the following results (see table 4).

**Table 4 The Results of Performance Evaluation of 12 Departments of W**

DMU	Crest	Vrste	Scale	Evaluation
DMU <sub>1</sub>	1.000	1.000	1.000	DEA effective, scale efficiency is no change
DMU <sub>2</sub>	1.000	1.000	1.000	DEA effective, scale efficiency is no change
DMU <sub>3</sub>	1.000	1.000	1.000	DEA effective, scale efficiency is no change
DMU <sub>4</sub>	0.967	1.000	0.967	Not DEA effective, scale efficiency is incremental
DMU <sub>5</sub>	1.000	1.000	1.000	DEA effective, scale efficiency is no change
DMU <sub>6</sub>	1.000	1.000	1.000	DEA effective, scale efficiency is no change
DMU <sub>7</sub>	1.000	1.000	1.000	DEA effective, scale efficiency is no change
DMU <sub>8</sub>	1.000	1.000	1.000	DEA effective, scale efficiency is no change
DMU <sub>9</sub>	1.000	1.000	1.000	DEA effective, scale efficiency is no change
DMU <sub>10</sub>	1.000	1.000	1.000	DEA effective, scale efficiency is no change
DMU <sub>11</sub>	0.767	0.824	0.932	Not DEA effective, scale efficiency is incremental
DMU <sub>12</sub>	0.990	1.000	0.990	Not DEA effective, scale efficiency is decreasing
<b>Average</b>	<b>0.977</b>	<b>0.985</b>	<b>0.991</b>	

**Note:** Crste = technical efficiency from CRS DEA; Vrste = technical efficiency from VRS DEA  
Scale = scale efficiency = Crste / Vrste

### 3.3 The analysis of the efficiency evaluation of input-output of teaching department of W's teaching department

Table 4 shows that the means of Crest of the departments is 0.977, the means of Vrste is 0.985, which implies that the ratio of input and output is in good condition. However, the values of three departments are not effective. They are DMU4, DMU11 and DMU12. This is caused by the small scale which is reflected by Vrste value of DMU4 and DMU12, 1.000. The crest and Vrste value of DMU11 is 1.000, it suggests that caused by the inefficient management besides the scale of labour input, financial input and material input are small. The percentage of the effective department is 75%, which indicates that the efficiency of input-output is relatively high. This may owe to the long-term input of teaching and research made by W.

We can also utilize the free variable to measure DUM11, by which we will propose the improvement suggestion. The measurement suggests that DUM11 should reduce the staff's salary and fringe benefit by 171,600 yuan and decrease the material input by 1,207,800 yuan. At the same time, it should increase the scale of student enrolment by 9 and the comprehensive value by 7.

## 4 Conclusion

The efficiency of input-output of the teaching departments determines one university's performance. We set 6 parameters for labour, materials and finance and 7 parameters for output according the four aims of universities. The efficiency of input-output is reflected by comprehensive efficiency which consists of technical and scale efficiency. The comprehensive efficiency is measured by DEA model  $C^2R$ ; technical efficiency is measured by DEA model  $BC^2$ ; and scale efficiency is obtained by using the formula comprehensive efficiency/technical efficiency. We apply these models to a university and particularly measure the comprehensive efficiency, technical efficiency and scale efficiency.

We found that the accuracy of this method is determined by the suitable index system of input-output and its reliability. As a result, the conclusion of this research might be limited due to two aspects: one is that the unit number is small, which determines the number of indices; another is that DEA requires that all units must be homogeneous. However, the disciplines in different departments are different from each other. These two factors may lead to the gap between the research result and reality may occur. Besides, the methods to acquire the index data and the unreasonable setting of evaluation criterion also may affect the accuracy of the evaluation. These problems are worthwhile for the further study.

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# Analysis of Contribution of Information Industry to National Economy Development in China

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**Abstract:** The proportion of China's information industry in the GDP after financial crisis has been investigated firstly in this paper. Output value of information industry proportion in the GDP increased gradually from 2001 to 2006, up to 2006, which made up of 25.47% of the GDP. Nevertheless, its proportion in the GDP has started to count less since 2006. According to the Douglas function, the paper analyzes the contribution of information industry to national economy development next. Clear-cut correlation between information industry and the GDP indicates that the increase of one unit of the logarithm of the output value of information industry will cause the increase of the GDP's logarithm by 0.071 units. Finally, the paper expatiates the role of information industry in promoting the industrial structure optimization and upgrading, its economic benefits and its direct and indirect effect on economic growth.

**Key words:** Information industry; Cobb-Douglas production function; Economic contribution

## 1 Introduction

The international financial crisis poses difficulties for the development of China's information industry in 2009. In 2009, the telecommunication services in China reached RMB 2,568.06 billion, up by 14.4%; the telecommunication's main business income was RMB 842.43 billion, up by 3.9%. The above scale manufacturing industry of electronic information products accomplished sales revenue of RMB 5,130.5 billion, up by 0.1%. On the whole, the output value of information industry and its proportion in the GDP is shown as Table 1.

**Table 1 The Proportion of Information Industry in the GDP in China**

Year	Output value of information industry(billion Yuan)	GDP (billion Yuan)	Proportion of Information industry in the GDP
2001	1,499.80	10,965.52	13.68%
2002	1,753.85	12,033.27	14.58%
2003	2,341.00	13,582.28	17.24%
2004	3,173.76	15,987.83	19.85%
2005	3,879.90	18,321.74	21.18%
2006	5,398.38	21,192.35	25.47%
2007	6,328.01	25,730.56	24.59%
2008	5,988.76	30,067.00	19.92%
2009	5,972.93	33,535.30	17.81%

Data Source: China Economic Information Net and "Statistical Yearbook of China"

As seen from Table 1, the output value of information industry increases considerably from 2001 to 2007, and it approaches stable during 2007 to 2009. Meanwhile, its proportion in the GDP gradually rises from 2001 to 2006 and reaches 25.47% in 2006, but starts to fall by degrees after 2006.

## 2 Contribution of Information Industry to National Economy Development in China

The data selected from 2001 to 2009 proclaims the contribution of information industry to national economic development.

### 2.1 Selection of regression model

Cobb-Douglas production function is a common tool for measuring the contribution of economic growth, and its mathematic expression is as follows<sup>[1]</sup>:

$$Q = aK^b L^c \tag{1}$$

Note: Q is output, K is capital, L is labor, and a, b and c are constants.

The feature of Cobb-Douglas production function:

① Its logarithmic form is a linear function

$$\log Q = \log a + b \log K + c \log L \tag{2}$$

② It belongs to homogeneous function, and the type of returns to scale(RTS) can be judged by the numerical value of b+c

b+c > 1, is increasing returns to scale type;

b+c < 1, is decreasing returns to scale type;

b+c=1, is stable returns to scale.

③ The variable K of this function, the index b of L and c respectively are the output flexibility of K and L, which means that the output will increase b%, if K increases 1%; if L increase 1%, the output will increase c%.

In order to further analyze the contribution of information industry to and its effect on economic growth, the technological progress factor will resolve into information technological progress factor and other technological factor, and the specific expression is given as follows:

$$a = a_0 I^d \tag{3}$$

Note: I means the development scale of information industry, d means the output flexibility of information industry and  $a_0$  means all the other technological progress factors except information technological progress factor.

In this case, Cobb-Douglas production function is adapted as follows:

$$Q = a_0 I^d K^b L^c \tag{4}$$

The logarithm of each side of an equation is as follows:

$$\ln Q = \ln a_0 + d \ln I + b \ln K + c \ln L \tag{5}$$

Note: GDP means the gross output, d means the output flexibility of information industry, I means the output value of information industry, K means the fixed assets investment of society and L means total employment of society<sup>[2]</sup>.

### 2.2 Analysis process

“Statistical Yearbook of China” is the source of the GDP, the output value of information industry is approximately replace by the sum of output value of electronic information industry and telecommunication industry, and the fixed assets investment and total employment of society are originated from “Statistical Yearbook of China”, then, the related date is showed by Table 2<sup>[3]</sup>.

**Table 2 Related Data**

Year	GDP	I	K	L
2001	10,965.52	1,499.80	3,721.35	730.25
2002	12,033.27	1,753.85	4,349.99	737.40
2003	13,582.28	2,341.00	5,556.66	744.32
2004	15,987.83	3,173.76	7,047.74	752.00
2005	18,321.74	3,879.90	8,877.36	758.25
2006	21,192.35	5,398.38	10,999.82	764.00
2007	25,730.56	6,328.01	13,732.39	769.90
2008	30,067.00	5,988.76	17,282.84	774.80
2009	34,050.69	5,972.93	22,459.88	779.95

Data source: “Statistical Yearbook of China” and China Economic Information Net. In this Table, the unit of GDP, I and K is billion yuan, and L's unit is million.

Table 3 is the logarithmic of Table 2:

**Table 3 The Logarithmic of Data from Table 2**

Year	lnGDP	lnI	lnK	lnL
2001	11.6051	9.6157	10.5244	11.1986
2002	11.6980	9.7722	10.6805	11.2083
2003	11.8191	10.0609	10.9253	11.2176
2004	11.9822	10.3653	11.1630	11.2279
2005	12.1184	10.5661	11.3938	11.2362
2006	12.2640	10.8964	11.6082	11.2437
2007	12.4580	11.0553	11.8301	11.2514
2008	12.6138	11.0002	12.0601	11.2578
2009	12.7382	10.9976	12.3221	11.2644

Put these data into SPSS to do the multiple linear analysis and the dependency table is showed by Table 4.

**Table 4 Dependency Table**

		lnGDP	lnI	lnK	lnL
Pearson dependency	lnGDP	1	0.952	0.998	0.991
	lnI	0.952	1	0.956	0.976
	lnK	0.998	0.956	1	0.995
	lnL	0.991	0.976	0.995	1

According to Table 4, the dependency between lnGDP and lnI is up to 0.952, therefore, the research on the relationship between these two variables is feasible. The linear equation obtained by regression analysis is given as follows:

$$\text{LnGDP} = 94.088 + 0.071\text{lnI} + 0.890\text{lnK} + 0.263\text{lnL} \quad (6)$$

Note: R<sup>2</sup>=99.7%, F=563.724, D.W.=2.080

### 2.3 Linear conclusion

R<sup>2</sup>=99.7% makes clear that the result of fitting is good, and, through linear equation, the dependency relationship between output value of information industry and GDP during 2001 to 2009 is proved to be obvious. In fact, output value of information industry's logarithm increases one unit will cause the GDP's logarithm increases 0.071 unit.

## 3 Impact of the Information Industry on the Development of National Economics

### 3.1 Upgrading of industrial structure under the influence of information industry

Information technique plays a crucial role in the upgrading of industrial structure because of its powerful permeability and a highly shared feature as a High-tech form. With the rapid development of information, Information technique dominates the upgrading of industrial structure gradually<sup>[4]</sup>.

First, the evolution of information technique and science result in the refinement of the division of social labor, besides, the degree of specialization become higher and higher, which contributes to the establishment of new-merging industries and industrial department. Their constant flourish enlarges the range of the industrial structure and strengthens the connection between different levels and circles in it. What is more, the mutual infiltration between disciplines and the cross-disciplines are widely used in research and application of research achievements. All of these elements force the connection between industries much closer and form a huge and complex industrial system. Therefore, the information technique and the development of information development will benefit for the adjustment of the industrial structure<sup>[5]</sup>.

Second, the improvement of the information industry encourages the reformation of the traditional industry and promotes the upgrading of the industrial structure. The industry cultivates plenty of

inter-disciplinary talents who involve both the informational and traditional industries. At the same time, this kind of industry provides the traditional industry with information techniques, informational equipments and information service, which motivate the whole course of information and improve the competitive ability of traditional industry. As for the traditional industry, it is required to reach a high-level and large field, and drives the information industry to a advanced direction, and enlarges its development scale. Besides, the information technique improves the production of traditional industry and changes its inner structure of production elements.

Lastly, the main function of information industry is the collection of knowledge and information, development, spread, etc. It is a knowledge industry supported by techniques and knowledge. The social knowledge and techniques focus on or come from the information industry. The input of information industry includes visible capital, labor, and invisible talent and so on. Information industry has become a crucial part of the whole development of social economics and strengthened the stability of the development of economics. Meanwhile, the demand income elasticity is higher in information industry, and the potential market is large, however, the cost of production is comparatively lower, which make it more competitive in exploring the market. Therefore, information industry is equipped with some basic requirements that are set for some dominate industries. With the coming of knowledge economic age, information industry will generally replace the status of traditional manufactures such as steel industry, car-making industry, etc, and then become the leading industry of the world<sup>[6]</sup>.

### **3.2 The scale economies effect of information industry**

The Scale Economies Effect is a kind of phenomenon that the income rise and the cost of the unit product falls, which results from the expansion of the scale of production. The scale economies effect of information industry is the main factor facilitating economic growth. The key reasons why information industry has the scale economies effect are as follows. First, the form of assemblage in the field of information industry results in the cost reducing of the whole industry. Take the computer hardware for example. All these years, the constantly upgrading of computer hardware technology and the improving of products' quality and performance with a much lower price was reflected in this. Second, the characteristics of scale economies effect is also manifested in its decentralized management, specialization and globalization, and the latter two provided a favorite condition for information industry manufacturers to reduce production cost in a great deal which in term shows the advantages of scale economy. Third, the advantages in technologies and production process as well as the launch of laws and regulations for the protection of IPR all contribute to the maintenance of scale economy.

Besides, the natural monopoly of information industry makes it have its unique advantages. Information industry department stimulates the social economic development with its lower marginal coast in the process of production and servicing, while reducing the production and servicing cost in other aspects of society. Finally, it will accelerate the economic growth rate in the society. The effect of scale economy in information industry and the space aggregation effect are closely interrelated with each other. The gathering of information industries will result in aggregation effect, which can realize scale economic effect through optimizing the allocation of one's resources in a certain geological area. Through the space aggregation, we can not only reduce the cost but also promote the progress and spread of technology and generate huge profits which will attract more manufacturers to enter. For example, Information and home appliances industries groups in Pearl River delta region in China as well as finished automobile and auto parts industries groups in Shanghai both manifest the space aggregation effect.

### **3.3 The direct and indirect impact of information industry on economic growth**

#### **(1) The direct impact**

It can be seen from the above regression analysis on output value of information industry and gross domestic product (GDP) that information industry is the basic and initial industry in national economy. Besides, it also belongs to the category of advanced technology and modern service industry. The growing development of information industry and growing innovation of information technology have boosted the domestic demand which has gradually enlarged the employment scale and increased foreign trade and revenue which has directly stimulated the economic growth to enlarge the scale of national economy<sup>[7]</sup>.

#### **(2) The indirect and indirect impact**

The indirect impact of information industry on economic growth is mainly embodied as follows: there is a strong connection, including forward relevance and backward relevance, between information industry and other industries. Firstly, the forward relevance is mainly reflected that the development of information industry, to a large extent, depends on the demands of other industries on the information

industry products. That is to say, if the demands of other industries on the information industry products are of a great deal, the development of information industry can effectively promote the development and enlargement of other industries. Secondly, information industry and other industries are connected backward. The development of information industry also relies on the ultimate products of many other departments and industries, which can boost other industries to develop effectively. In this way, information industry and other industries are correlative with each other and help each other forward to push the growth of national economy.

#### 4 Conclusion

The information industry in our country takes a much higher ratio in national economy, and the ratio is ever growing. The output value of information industry has a prominent relation with GDP, that is to say, every 1 unit growth in the output value will result in 0.071 unit growth in GDP's logarithm. So information industry plays a very prominent role in promoting the growth of our national economy. Quick development in information technology facilitates the quick development of information industry in China, and the ever growing ratio of information industry in national economy growth makes information industry a more vital driving force behind our national economy. The information industry will continually boast the adjustment and upgrade of industrial structure and it will gradually grow into the leading industry in the development of our national economy.

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# Effect of Strategic Cost Management on Gaining Competitive Advantages: A Case of Jianfeng Group

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**Abstract:** Enterprises are thrown into a rapidly changing environment by the combination of globalization competition, rapid technological change, new products and the intense competition of the client base. This thesis, by comparative analysis of the strategic cost management and traditional cost management, using of the strategic cost theory and combining with the actual situation of Jianfeng Group, points out that through effective use of cost information and analysis while adjusting the development strategy of the enterprise can enable one to seize the current trend of the market and quickly become a bigger and stronger enterprise.

**Key words:** Strategic management; Strategic cost; Development; Competitive advantage

## 1 Brief Overview of the Strategic Cost Management

It is really a complicated definition about “strategy”. It can be regarded as a multidimensional concept that involves all the important activities of the enterprise, which provides enterprises with a unified sense, a direction sense and a purpose sense. In the meantime, it can also help business to adjust to the changing environment. Strategic cost management and strategic were tied naturally. One purpose of strategic cost management is to provide cost information for the selection and implementation of corporate strategy. Strategic cost management was first proposed in Strategic Management Accounting by the British scholar Kenneth. Symonds in 1981 who mainly studied the relationship of strategic cost management and the core competitiveness of enterprises of which he stressed that the cost management and corporate strategy combined with the strategic development of the enterprise is of great significance. Then the American scholar, Michael. Potter, Jack, Sank extended and developed the theoretical framework of strategic cost management and application methods, especially Michael. Porter applied value chain analysis to strategic control in his books the “competitive advantage” and “Competitive Strategy”. Strategic cost management can be divided into two levels: One is from the cost perspective to analyze, select, and optimize enterprise strategy. The other is the implementation of controlling strategies for cost.

## 2 The Contrast Between Strategic Cost Management and the Traditional Cost Management

The former is the corporate strategy in the cost side; the latter is the plan on the basis of the former in order to improve the effectiveness of cost management systems, methods and measures. <sup>[1]</sup> Compare Strategic cost management with traditional cost management. The backdrop of the strategic management exposes increasingly obvious defects of the traditional cost management performance.

First and for most, the traditional cost management focuses on the consumption of the value of internal production and business activities. As the view of Value Chain, the scope of the traditional cost management essentially used the notion of "value added" rather than the concept of "competitive advantage". From the perspective of strategic management, "value added" exist four defects: First, begin to manage cost after the procurement will lead to lost opportunities for strategic cooperation with the upstream suppliers, which could get the advantage of low-cost suppliers. Second, make the products sold in the end of cost management will lead to lost opportunities for strategic cooperation with downstream buyers and add the cost of the final consumers. Third, it does not consider the cost situation of competitors, which can not reveal the relative cost position compared with them. Forth, it hasn't from the perspective of the industry value chain to give an analysis of the strategic partnership and find ways to reduce costs. <sup>[2]</sup>

Secondly, the goal of traditional cost management is to furthest avoid the cost of the various business activities in order to seek a cost minimization and profit maximization, which is difficult to harmonize with the strategic management objectives. Objectively speaking, the traditional cost management purpose is driven by the initial motivation and direct action of the cost management. Although reducing costs for businesses at any time cannot be ignored, companies rely on new products'

development and that cost increased necessarily. In fact, traditional cost management focus too much on lowering costs in order to reduce costs instead of linking up cost management and competitive advantage, which can enable businesses to lose a good development strategy, affecting the formation of the competitiveness.

Thirdly, the management tools which used by traditional cost management aim to guide, normalize and constraint of the real production and business activities. It is based on real-time field controlling of management thinking. Strategic management focuses not on the implementation of the strategy but rather a strategic decision-making.<sup>[3]</sup> Whether the earlier standard cost control, the cost analysis and the corresponding volume-profit analysis, or the comprehensive quality management and responsibility are all without considering the strategic management of information needs.

Fourthly, traditional cost management only concerns about the cost factors, such as material costs, labor costs, financial costs and management costs while ignoring the implicit cost factors, such as market development, the arrangement of the internal structure, firm size and management culture. It has not been able to fully reveal the true composition of the cost of doing business; such costs will not be able to help managers to strategic decision-making.<sup>[4]</sup>

It is not difficult to conclude that: strategic management theories and methods are widely used in business management practice of traditional cost management, which presents a challenge to adaptive changes. The basic starting of this change include at least three points: First of all, to expand the spatial extent of the cost management, turn the objects from a simple focus on internal activities to outside the enterprise. Secondly, to expand the time range of cost management, elevate the time span from the level of daily management to strategic management. Thirdly, to innovate methods and means of cost management and to meet the demand of the strategic management of cost information better.

### 3 The Path of Strategic Cost Management

The core of the strategic cost management is to seek corporate and sustained competitive advantage, is a comprehensive and forward-looking combination of new cost management techniques, is an important trend in contemporary cost management, which compared to traditional cost management, has the differences below:

(1) Update concept and change thinking to completely break the mindset of 'neglecting efficiency and valuing saving'. We must break the ideological rigidity; update our concepts, from the overall, global, and long-term to consider the cost benefits of enterprise. To overcome the one-sided saving consciousness, we must emphasize the "people-oriented" of management thinking, the scientific and correct cost concepts to achieve cost management by traditional "cost savings" type of transformation to a strategic focus on efficiency ". Of course, the ideological shift of mind, by no means short span of time, we must strive to improve the business managers' ideology and scientific and cultural qualities, to actively learn and absorb foreign advanced cost management theory and methodology, to strengthen the organization building of Cost management and to improve the quality of accountants while creating a large number of cost management engineers so that we can take the road of combining technical and economic.

(2) Expand new areas of enterprise cost management, multi-angle, multi-faceted establish the company's cost management. The traditional cost management focuses on the production process, limits to the areas of production in scope and the manufacturing costs in content. With the development of production management techniques, the concept of cost in the vertical and horizontal has a new expansion. Accordingly, the cost management can no longer be confined to the traditional production process. The vision should be put wide to pay attention to scientific and technological progress and technological development, and continuously expand new areas of enterprise cost management. In the promotion and development of strategic cost management, reforming and improving the traditional cost management make the strategic cost management thinking and the specific cost management methods organically combined, and only in accordance with the requirements of the staff, the whole process of cost management, being strict and scientific to all the costs content involved, can the companies enhance the competitiveness of the products on the market.

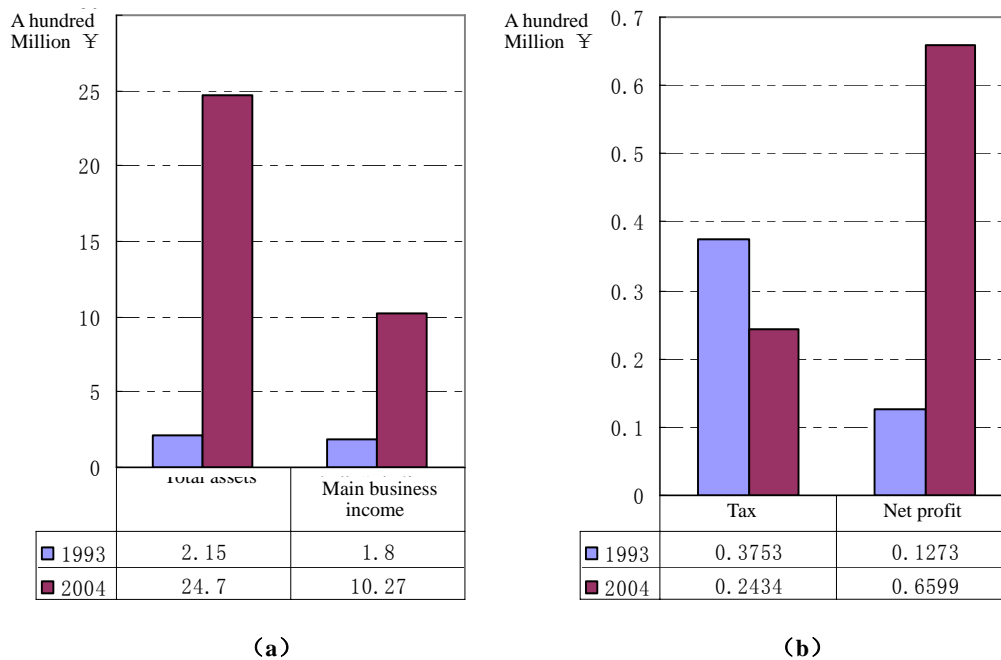
(3) Seek new methods of cost management from a strategic height. Merely the traditional cost management at the tactical level, talking about the cost on the cost, limited range of cost reduction is hard to improve the economic efficiency of enterprises. In a market economy, on one hand, within the enterprise must be subordinated to and services to improve efficiency of the management mechanism; on the other hand, the enterprise external intense competition to the market make the viability of

enterprises increasingly "bad", which prompted us to overcome the bound of the traditional mode of thinking that cost can not reduce, to understand the intentions and methods of reducing costs from a strategic perspective. Of course, in order to promote continuous improvement and development of the theory and methods of cost management in China, also should be noted that the summary of the innovative experiences and methods of cost management of their enterprise. In the process of enterprise cost management to introduce a comprehensive strategic management ideas and methods, only innovation to explore and develop new concepts and new ideas, will we be able to find suitable for our own characteristics and requirements of the cost of management theory and management methods to promote the enterprises' economic and social benefits all-round improvement.

(4)Fully mobilize the enthusiasm and creativity of the staff, to improve the employees of businesses to invest in the centripetal force. Per employee directly relates to costs. Only rely on the co-ordination of all staff, joint efforts, the enterprise can cost in the real control in order to achieve the objectives of the strategic cost management. Enterprises should pay attention to the human factor, stress people-oriented, and object to the rule of man, to improve the cohesion of the staff, so as to achieve the goal of lower costs and gain competitive advantage.

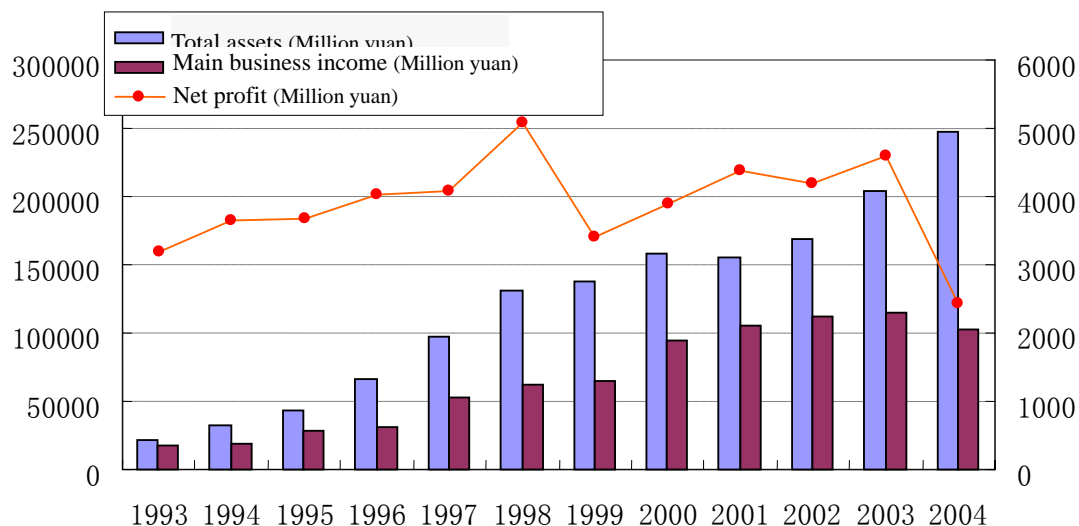
#### 4 High Costs Reduce the Competitiveness of the Jianfeng Group

Jianfeng Group, formerly known as Jinhua Cement plant in 1958, In 1988, it implemented the shareholding system reform, which confirmed the establishment of Zhejiang Jianfeng Group Co Ltd. And then, the company of shares listed in the Shanghai Stock Exchange becomes the first listed companies in China's cement industry in July 28, 1993. Jianfeng Group seized the historical opportunity again and again to develop. According to the 2004 Annual Report, Jianfeng Group owned total assets of 2.47 billion RMB, the main business income reached 1.027 billion RMB, profit 24.34 million RMB, taxes of 65.99 million RMB, which are of 11.5 times, 5.7 times and 0.65 times, 5.18 times of the beginning respectively.(see following Figure 1). For now, Jianfeng Group has become a basing on two main industry, cement and medicine, modern large-scale enterprise.



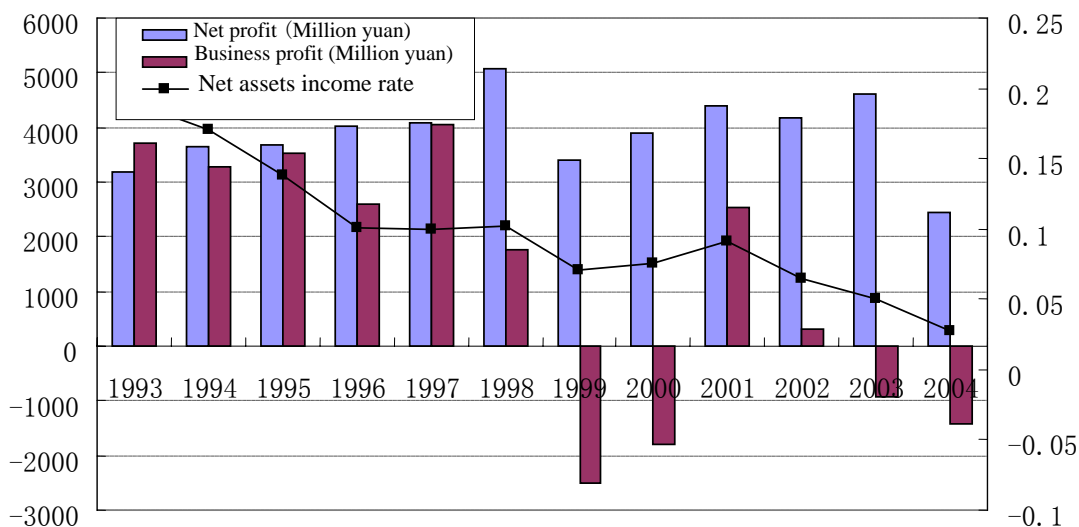
**Figure 1 Data of Jianfeng Group Financial Development in 1993 and 2004**  
(Data from: 1993, 2004 Jianfeng Group Annual Report)

Since to be listed, Jianfeng Group manages steadily and surely with operating profit, the main business income rose year after year (except 2004), the asset size of mid-extended (except 2001), reflects the company's good growth (see following Figure 2).



**Figure 2 Data of Jianfeng Group Financial Development from 1993 to 2004**  
(Data from: 1993-2004 Jianfeng Group Annual Report)

Compared with the company's growth, the profitability doesn't follow the steps; it seems, on the contrary, falling down (see following Figure 3). Although the company makes profit every year, the net margin has paced up and down between 20 million and 40 million with no growth. There is a huge fluctuation in operating profit in the five years from 2000 to 2004 with three years of losses and one year low-profit. The return on net worth is declining with years goes by, listed at the beginning of 19.02% ( highest point ) all the way down to 2.71% in 2004 ( lowest point ). The year 2000 to 2004 were the golden periods of China's cement industry, but Jianfeng group belonging to the cement blocks off profits, which provide food for thought!



**Figure 3 Data of Jianfeng Group Profit Development from 1993 to 2004**  
(Data from: 1993-2004 Jianfeng Group Annual Report)

There are many reasons to explain Jianfeng Group's situation, the most important one is the growing competition in the cement industry. From the cost perspective: 1) Foreign, joint ventures and private enterprises have their tax incentives. But regulate the operation of State-owned enterprises have no tax breaks nor can they evade taxes. 2) Jianfeng Group is one of the oldest state-owned enterprises with a large number of retired staff salaries to pay. Compared with new businesses, the cost is significantly higher. 3) As a veteran of the state-owned enterprises, the state explicitly eliminated a large shaft kiln production lines due to the environmental issues, which not only caused a significant loss of

assets to the Jianfeng Groups, but to put the company living in a disadvantage competitive position due to its incapacity of production making, which also makes its market shares be tied up by others. 4) Jianfeng Group is in strict accordance with national standards to produce cement. Its admixture adding progress has been done seriously and it has put more than all other funded enterprises in terms of environmental input. And such differences in cost caused by the system, history, taxation is very difficult to have a significant change in a short time. The enterprise must resort to external force in order to reduce costs and reverse the market disadvantage.

## 5 Powerful Combination of Spikes From a Strategic Height to Seek a New Cost Management

April 17, 2007, Zhejiang province Jianfeng Group Co., Ltd. notice a cooperation matters which disclosed the cooperation framework between Jianfeng group and Zhongjian Group, specifically as follows: 1) cooperating with Zhongjian group to found a regional specialization Cement Company (hereinafter referred to as "the New Company"), which is committed to enlarge the regional cement business scale and integrate the business and reduce overall operating costs in order to obtain the best economic and social benefits. 2) Zhongjian Group agreed to invest in , at the same time Jianfeng Group audit and evaluate the recent cement business-related assets of Zhejiang part (except shaft kiln), then contribute to the new company through partial retention or/and some realized or/and partial transposition , but the specific proportion need further consultation to determine. 3) The Zhongjian Group agrees to maintain Jianfeng Group's main business relatively stable in the cooperation process. The megamerger between Jianfeng Group and Zhongjian Group is not completed in one day, however it is the inevitable result of joint strategy when Jianfeng Group is aware and assessing the situation that it is impossible to change such institutional and historical factors which made cost disadvantage on their own.

In 1992 Jianfeng Group claimed their development strategy "Based on the building materials, developing for diversification, backed by Jianfeng, facing the world", and begin to involve the diverse business. In 2001 the Group of the encounter, pronounced: "Stressing the large and deregulating the small, highlighting the main business" and it symbolized the end of the diversified development strategy, in this 10 years, the businesses have involved in many areas of cement, pharmaceuticals, ceramics, cable, information technology, wholesale and retail trade, real estate, up to dozens of holding shares of companies (as the following table).

**Table 1 In 2000 Jianfeng Group Holding & Shareholding Enterprises**

Year	Holding subsidiary enterprises (consolidated statements)	Holding subsidiary enterprises (not consolidated statements)	Long-term equity investments enterprises	Total
2000	21	2	16	39

(Data from: 2000 Jianfeng Group Annual report )

In 2001, Jianfeng Group proposed the idea of "Stressing the large and deregulating the small, highlighting the main business", in 2002 to fully implement the strategic approach of "enhanced building materials, grow medicine", persist in the principle to do certain things. According to the Annual Report from 2001 to 2004, Jianfeng Group, under the guidance of "Stressing the large and deregulating the small, highlighting the main business", accomplish following events: the establishment of an investment company, responsible for investment and business cooperation; highlighting the main business, plus investment in the cement and pharmaceutical; restructuring non-core business. Jianfeng Group industry is clearly growing portfolio. In 2001 cement production capacity is 1.5 million tons, the sales income is 300 million Yuan, however in 2004, cement production capacity has reached 3.8 million tons, and sales income rose to more than 500 million. As what has been expected, to the end of "Eleventh Five-Year" period peak cement production capacity will reach 10 million tons; medicine in terms of R & D, production and sales has been strengthened.

Jianfeng Group is well aware that under the existing framework, relying solely on means to improve management and increase labor productivity has been difficult to reverse the disadvantage in terms of cost caused by the formation of institutional and historical reasons, in order to reduce costs in the short term, gain the competitive advantage. To reduce costs in the short term to gain the competitive advantage, it is very difficult, only the application path of cost management mode which is the third innovation, by the formation of strategic alliances, through its own to expand capacity, to reduce the tons of cement costs through economies of scale expansion. Jianfeng Group's strategy is moving toward

bigger and stronger the main industry; especially the cement industry only through cooperation with other strength of the enterprises can help them go out of the dilemma.

## 6 Conclusion

On account of historical and institutional benefits, Jianfeng Group was able to grow and develop greatly .However, due to the same reasons, the cost of Jianfeng is keeping up a high level, leading to the difficulties on the development recent years, the company is big but not strong enough.

Traditional cost management was concerned the value consumption from internal production and business activities, but rarely consider and analyze the external environment, the scopes and means of reducing costs have big limitations, the cost information provided may not meet the development of strategic management of the enterprise. Strategic management not only must focus internal situation, but also clearly know the competitive environment. It is not only necessary to know the upstream suppliers, but also to clearly know the downstream customers and distributors, and to coordinate the relationship with them. Meanwhile, the enterprise also needs to analyze and research the basic situation of the competitors. The Strategic cost management needs a higher perspective and a greater scope to investigate the cost of business, which will more effectively adapt to corporate strategy. <sup>[5]</sup> It depends that Jianfeng Group considers the limitations about self disadvantages for reducing cost, so it can confirm its strategy purpose which contains find the strong industry and make an alliance. The facts have proved that such cooperation can rapidly expand business productivity, through economies scale advantages it rapidly reduces cost, and gains the regional markets competitive advantage.

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# What Makes You More Central?

## Antecedents of Changes in Centrality in Technology-Based Alliance Networks

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**Abstract:** Although central network positions have been associated with above average performance effects, an important void that still remains is how firms come to occupy a more central position in the first place. Whereas recently made exogenous explanations have shed some more light on aggregate changes in centrality, they remain silent on an endogenous understanding of how individual firms can come to occupy a more central position. To address this, we argue and demonstrate how heterogeneity in firm-level attributes formed by their possession of pioneering technology, alliance portfolio size and choice for alliance organization drives differences among firms in becoming more central. Based on a sample of technology-based alliances in two different high-tech industries (pharmaceuticals and the broader ICT industry), we find evidence for most of our hypotheses. We contribute to the standing literature by considering changes in position as a dependent variable, which goes beyond the dominant approach in which network structural properties have mostly been treated as independent variables. In this way, we contribute to an emerging literature in which the focus shifts away from how network embeddedness enables and constrains action towards what factors affect and shape a firm's network embeddedness through the lens of its structural position.

**Key words:** Central network positions; Pioneering technology; Betweenness centrality

### 1 Introduction

A growing number of studies has shown that strategic alliances and interfirm networks are particularly relevant for innovation and the development of new technology (Ahuja, 2000a; Gilsing et al., 2008; Phelps, 2010; Sampson, 2007). Especially in technology-based industries, alliances can be considered as conduits through which firms can get access to the complementary resources and knowledge of partners (Gimeno, 2004; Powell et al., 1996). Moreover, it has been argued that a firm's position in an alliance network affects the speed and degree in which access to these external resources can be acquired. More specifically, it has been demonstrated that a central position provides a firm with faster access to high(er) quality external resources and capabilities than a less central one (Powell et al., 1996; Zaheer and Bell, 2005). In line with this, a central position has been demonstrated to carry positive effects on, among others, power (Krackhardt, 1990), reputation (Galaskiewicz, 1979; Stuart, 1998), early adoption of innovations (Rogers, 1971), innovation performance (Powell et al., 1996) and learning (Hamel, 1991).

Although there is a large heterogeneity among firms in network positions (Provan and Sebastian, 1998), a firm's network position is not fixed and may change over time. Here, changes in technology and/or regulation have been advanced as exogenous explanations of changes in positions of individuals in intra-firm networks (Burkhardt and Brass, 1990) as well as of changes in firms' positions in alliance networks (Madhavan et al., 1998). This still leaves open an endogenous understanding of changes in centrality, and in line with this how firms can possibly come to occupy a more central position. The aim of this paper is to address this, by means of which we contribute to the literature along the following lines.

Although the antecedents of tie formation at the dyad level have been well studied in the literature (e.g. Ahuja, 2000b), the dominant focus until now has been on how network structural properties can be used to advantage (Baum et al., 2000; Burt, 1992; Coleman, 1988; Dacin et al. 1999; Powell et al., 1996; Uzzi, 1996; 1997). Our study addresses an important void in the literature given this general negligence of the antecedents of network structural properties (Raab and Kenis, 2009; Salancik, 1995). This echoes Salancik's earlier claim (1995) that network research should move beyond questions on outcome effects of network positions, and consider questions that focus on why certain positions exist or did not exist

before.<sup>1</sup> As a consequence, an inquiry into the antecedents of changes in centrality may help to inform us in how far and in what ways firms can come to occupy a more central position. An implication that follows is that we consider changes in centrality as a dependent variable, which serves as an important contribution to the standing literature in which network structural properties have mostly been treated as independent variables. In this way, we also contribute to an emerging literature in which the focus shifts away from how networks enable and constrain action towards what factors affect and shape networks and their structural properties (Gilsing and Nooteboom 2006; Koka et al., 2006; Madhavan et al., 1998; Rosenkopf and Schilling 2007).

Our empirical setting is formed by two global high-tech industries: pharmaceutical and the broader ICT industry (computers, semi-conductors and telecom). In both industries, interfirm collaboration is a strategic necessity and has led to the formation of so-called 'global' network structures (Schilling, 2009). Our understanding of a global network structure is as follows. Its building blocks are formed by individual dyadic alliances between firms, which collectively make up for an entire network structure that may easily cover a few hundred alliances or even more. Following from this focus on a global network structure, we will focus on Betweenness Centrality (BC) that reflects global centrality. Such a global network structure differs from a firm's individual ego-network, or 'local' network, and its associated degree centrality.

The paper proceeds as follows. The next section presents the theoretical framework and develops four hypotheses. Next we describe the data, variables and methods, and then present our empirical results. In the final section we conclude and discuss the implications of our findings.

## 2 Theory and Hypotheses

### 2.1 Network position: betweenness centrality (BC)

Betweenness centrality (BC) views an actor as being in a favoured position to the extent that it falls on the geodesic paths between other pairs of actors in the network. That is, the more companies depend on a focal firm to make connections with other companies, the higher the BC of the focal firm becomes. Such a position offers a focal firm strategic benefits such as opportunities for brokerage, faster access to diverse and non-redundant information but also visibility as well as power in controlling the flows of information and resources throughout the network (Burt, 1992). As a consequence, a position with high BC will enable firms to extract extraordinary returns from its attractive and powerful position in the network. BC is also of particular relevance in an innovation-based setting as here an increase in a firm's BC will increase the likelihood of being at the crossroads of key information and knowledge flows through the networks. In this way, BC elevates the potential for recombination that contributes to a firm's innovation performance (Gilsing et al., 2008). Apart from acquiring information, BC also offers room for sending information and the build-up of power. Within an innovation context, a high BC may for example support central players in setting and/or maintaining technological standards in their respective industries (Rosenkopf and Padula, 2008).

### 2.2 Antecedents of changes in BC

Burt (1991) suggests that the causal force behind centrality lies in the direct and indirect 'demand' by alters for relations with a focal actor. This is in line with social exchange theory suggesting that a firm must have something of value to offer in order to become or stay attractive to others (Blau, 1964; Emerson, 1962). The implication for inter-firm collaboration is that if a firm aspires to become more central, it must be considered as attractive enough for collaboration in the eyes of others. We refer to what a focal firm has to offer as its possession of *resources* that make others desirous of collaboration. However, whereas 'being in demand' may offer opportunities to occupy a more central position, it will not tell the whole story. Recently, it has been suggested that it is also entrepreneurial behavior or certain actions by 'network entrepreneurs' which would lead to a more central network position (Ozcan and Eisenhardt, 2010; Ahuja et al., 2011). The entrepreneurship literature distinguishes between three mechanisms that serve to understand entrepreneurial behavior in general, namely (1) incentives, (2) opportunity and (3) ability (Minniti and Bygrave, 1999; Shane and Venkataraman, 2000).<sup>2</sup> So, apart

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<sup>1</sup> More precisely, Salancik phrased this question in terms of bridging positions and referred in particular to structural holes. 'A more telling analysis might explain why the hole exists or why it was not filled before?' (Salancik, 1995: 349).

<sup>2</sup> Although the distinction between incentives, opportunities and ability is used as the three determinants of entrepreneurial action and behavior, it is also used in the resource dependence literature when emphasizing that firms do not only need to be motivated to reduce external dependence but also have the opportunity and ability to do



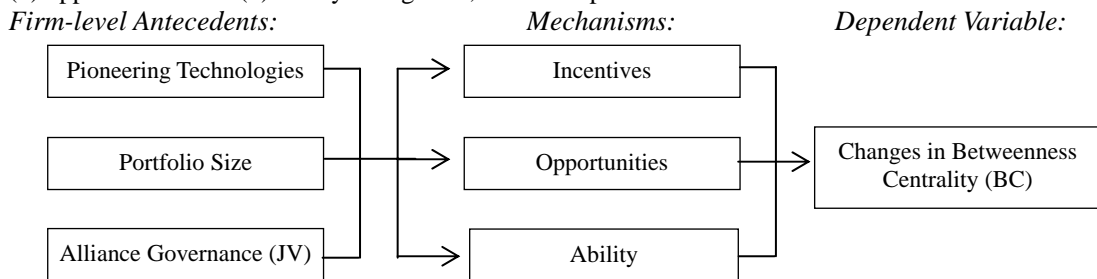
from opportunities arising from being in demand, a firm must also have an incentive or a motivation to move into a more central position. In addition, it must have the ability to exploit the most attractive opportunity. We consider these three elements - incentives, opportunities and ability - as the mechanisms **2.3 Through which a firm’s possession of resources lead to changes in its centrality.**

We differentiate between both technological and social resources, each of potential value to other firms and, in this way, each forming a different antecedent of how a firm may become more central. Technological resources may be of value to others to the extent that they lack this, and may form a major reason why others are interested in collaboration with a focal firm (Pfeffer and Nowak, 1976; Ahuja, 2000b). Here, we specifically focus on the role of pioneering technology that tends to reflect path-breaking ideas and carries with it the potential of major breakthroughs. Its possession is likely to be associated with high attractiveness to others and may yield opportunities for brokerage accordingly (Ahuja, 2000b; Gulati and Garguilo, 1999), whereas it may also affect a firm’s incentives and ability.

The role of social resources emerges from the social exchange and embeddedness literature, which propose that alliance activity is embedded in a wider network structure from prior and ongoing collaborative relationships (Gulati and Garguilo, 1999; Walker et al., 1997). Here, we consider a firm’s portfolio of direct partners as this may provide it with access to external knowledge and expertise, as held by its direct partners. The more sizeable a firm’s portfolio of direct ties, the more access it may have to heterogeneous sources of knowledge or information, and the higher status it may enjoy among its peers (Ahuja 2000a; Podolny, 1994), both of which may increase a focal firm’s attractiveness to others as well as its incentives and ability.

Both a competence and embeddedness perspective, as discussed above, consider the facilitative role of collaboration and point especially to its benefits. In contrast, a governance view focuses on risks that may be associated with collaboration. It considers knowledge flows between partners as undesirable spillovers that may give rise to opportunism and free-ridership, which diminishes possibilities for appropriating returns of newly created technology (Dhanaraj and Parkhe, 2006; Gulati and Singh, 1998; Nooteboom, 2004). In order to broker among unconnected partners, a firm must not only have something to offer but must also protect itself against imitation or spillover, in order to *remain* attractive to others in the future. This is especially relevant as we consider BC that may be associated with bridging among unconnected partners and collaborating with disembedded ‘strangers’ (Baum et al., 2005). Therefore, we also consider a third antecedent of changes in BC, namely alliance organization. The choice for an alliance organization between equity or non-equity forms a key governance decision that affects the possibilities for mitigating risks that may arise in collaborative processes (Sampson, 2007).

So, we will consider the role of three antecedents, namely a firm’s possession of pioneering technology, its portfolio size and the governance choices through the alliance organization that it makes. More specifically, we argue that firms’ heterogeneity regarding their possession of pioneering technology, the size of their alliance portfolio and their alliance organization choices leads to heterogeneity in their entrepreneurial behavior of moving into a more central position. In line with this, we consider pioneering technology, portfolio size and alliance organization as firm-level antecedents of changes in centrality, whereas the mechanisms *through which* this occurs are formed by (1) incentives, (2) opportunities and (3) ability. In figure 1, this conceptual model is shown.



**Figure 1 Overview of the relationships between antecedents, entrepreneurial behavior mechanisms and Changes in betweenness centrality (BC)**

so (Pfeffer and Salancik, 1978). But it has also been used to explain why people engage in criminal activities (Nooteboom, 2000). Furthermore, it is also compatible with Ahuja’s framework (2000b) that distinguishes between incentives and opportunities when explaining alliance formation, whereas he does not consider a firm’s ability. We argue that to fully understand the entrepreneurial actions that lead to changes in centrality, the role of ability needs to be included as well.

Based on this, we first discuss below the role of pioneering technology, portfolio size and alliance organization separately, as antecedents of changes in a firm's BC. Next, we combine a competence with a governance perspective by jointly considering pioneering technology and alliance organization.

### **Pioneering technology**

Here, we consider how its possession of pioneering technology may affect a firm's BC, through the combination of incentives, opportunities and ability.

*Incentives.* Pioneering technology is formed by completely 'de novo' technology that goes (far) beyond all available solutions. Its creation requires a deliberate managerial choice to explore (far) beyond existing technologies, solutions, approaches in order to arrive at highly original solutions for basic problems based on a deep understanding of their root causes (Ahuja and Lampert, 2001). Its possession does not come by chance but tends to be the result of a persistent strategy of diligently exploring new domains. External collaboration may contribute to this strategy to the extent that it enables a firm to explore these unknown domains and experiment with highly original solutions. So, the possession of pioneering technology may elevate incentives for a focal firm to collaborate with other firms that are entirely disconnected from it. Collaboration with these partners may introduce a focal firm to new solutions or help it to understand problems in profoundly new ways that may help it in the further development of new pioneering technology. In this way, by moving into a broker position through collaboration with unconnected alters, a focal firm may further improve its potential for pioneering recombinations. In addition, when a focal firm lacks the resources or the complementary assets to upscale and commercialize its pioneering technology, it may become highly motivated to collaborate with partners that are well endowed in this respect (Ahuja, 2000b). Partners in possession of these resources and assets tend to occupy more central positions in a network structure than firms that lack these (Podolny, 1994; Ahuja et al., 2009). Collaboration with them may increase a focal firm's own centrality. In sum, the possession of pioneering technology may elevate a focal firm's incentives to collaborate with unconnected and/or with (highly) central others.

*Opportunities.* Pioneering technology might contribute to the emergence of a new technological paradigm with potentially profound consequences for the established status-quo in an industry (Nelson and Winter, 1982). To the extent that it is competence-enhancing it may strengthen the position of incumbents, whereas in case it is competence-destroying it may eventually lead to their demise (Tushman and Anderson, 1986). Given these potentially strategic implications of pioneering technology, other firms may develop a key interest in it. As a consequence, the possession of pioneering technology may strongly elevate the attractiveness of a focal firm to others and thus also provide it with opportunities to move into a more central network position.

*Ability.* Possession of pioneering technology may contribute to a firm's ability to ally with partners from unconnected parts of the network, for two reasons. First, possessing pioneering technology signals that a firm is capable to step into the unknown and to effectively find itself a way through it. This contributes to the build-up of absorptive capacity (Cohen and Levinthal, 1990), and may support a firm in bridging a (very) large technological distance with unconnected partners. Second, to the extent that a focal firm possesses more pioneering technology, it may have more bargaining power when (re)negotiating deals with its existing or new partners (Ahuja et al., 2009). In this way, having pioneering technology may also contribute to the ability to exploit the most attractive opportunities for brokerage.

Overall, pioneering technology carries a positive effect on both the incentives, opportunities and ability for brokering across unconnected partners, leading to an increase in its BC. This suggests our first hypothesis:

*Hypothesis 1: There is a positive relationship between a firm's possession of pioneering technology and an increase in its BC.*

### **Portfolio size**

In line with the literature, we consider the size of a firm's alliance portfolio as the number of its direct partners (Vasudeva and Anand, 2011). Below, we consider how portfolio size may affect a firm's BC through its incentives, opportunities and ability.

*Incentives.* A small-sized portfolio of direct partners may not foresee sufficiently in a focal firm's needs for key external resources and capabilities. As a consequence, a small portfolio may create incentives to move into a broker position and collaborate with alters that are unconnected to the focal firm and its portfolio of direct partners. In this way, through the addition of alliances with one or more unconnected partners, a focal firm may increase the potential for access to novel knowledge and

expertise that is non-redundant with the combined knowledge stock of its existing portfolio of partners.

However, at high levels of direct partners, the addition of one or more unconnected partners may increase two risks. First, there is a risk of cognitive overload as it may become increasingly difficult to be able to absorb and integrate a large number of heterogeneous streams of knowledge arriving at the focal firm. This makes it less attractive to move into a broker position as the addition of an unconnected partner would contribute even further to this risk of cognitive overload due to a large(r) technological distance. Second, there is an increasing risk of a severe incongruity between the different organizational practices and routines that each partner carries (Lavie et al., 2011), a risk that will aggravate dramatically when adding unconnected partners whose behavioral norms and routines may also be (very) different (Hargadon and Sutton, 1997; Burt, 2007). As a consequence, beyond a certain point, a large portfolio may reduce a firm's incentives to move into a broker position. Overall, this suggests that the size of firm's portfolio has a curvilinear effect on its incentives to move into a brokering position.

*Opportunities.* A portfolio of partners may signal a focal firm's standing in a network structure (Powell et al., 1996). The larger the size of its portfolio, the more it may elevate a focal firm's status and contribute to raising its attractiveness in the eyes of disconnected alters. Furthermore, a sizeable portfolio may indicate a focal firm's competence in generating positive alliance outcomes for its partners, which may signal reliability and trustworthiness to others (Wong and Boh, 2010). This may raise interest on their side and generate new partnering opportunities for a focal firm (Kale and Singh, 2007). In this way, the larger a firm's portfolio, the more it may become an attractive 'target' for collaboration, also by unconnected alters that may associate a larger portfolio of a firm with lower collaborative risks and potentially higher rewards.

However, these attractive benefits of a growing portfolio may hold up to a point. The larger a focal firm's portfolio, the higher the risk of spillovers of specific knowledge and expertise of the unconnected partner(s) to this set of direct partners. The unconnected partner may have limited room to mitigate this risk, making it more reluctant in collaborating with a focal firm with a large portfolio. Overall, this suggests that the size of a firm's portfolio has a curvilinear effect on its opportunities to move into a brokering position.

*Ability.* A portfolio of direct ties may be indicative of the presence of a 'portfolio' capability of a focal firm that refers to a firm's ability of managing a set of partners, rather than (individual) dyadic relationships (Wassmer, 2011). In this respect, a portfolio capability may support a focal firm also in brokering by being able to manage the degree of fit and potential conflict with its existing partnerships and achieve synergies here. However, at high levels of direct partners, this capability may get diminished as managerial resources may become too thinly spread, knowledge integration tends to become increasingly complex and there are more partners with less time for monitoring, increasing risks of undesirable spillovers and freeridership. This is in line with the portfolio literature demonstrating that a too diverse portfolio carries a negative effect for a firm's ability to attract value from its portfolio (Faems et al., 2005; Wassmer, 2011; Vasudeva and Anand, 2011). This suggests that the size of firm's portfolio also has a curvilinear effect on its ability to move into a brokering position.

In sum, an alliance portfolio has a curvilinear effect on incentives, opportunities and ability to move into a brokering position. This suggests our second hypothesis:

*Hypothesis 2: There is a curvilinear relationship between the size of a firm's portfolio and an increase in a firm's BC.*

### **Alliance organization**

Technology-based collaboration implies the sharing and/or transfer of knowledge over firm boundaries, which comes with some unique challenges. Especially when knowledge is more tacit and/or complex, its successful exchange and recombination is not assured (Powell et al., 1996), making the organization of the alliance between firms particularly important. In addition, the choice for a certain alliance organization also forms a key governance decision for diminishing risks that may arise in collaborative processes (Gulati and Singh, 1988). In general, joint-ventures (JVs) are considered as well equipped for knowledge sharing between firms, in particular for the exchange of tacit and complex knowledge (Sampson, 2007). In addition, JVs offer greater possibilities for monitoring and control that eases concerns for opportunism and spillovers to partners and/or partners' partners (Gulati, 1995a). However, JVs are costly as they not only require the investment of equity but also employ more formal control and organizing mechanisms such as authority systems, incentive systems and standard operating procedures (Gulati and Singh, 1998). In contrast, bilateral contracts do not offer the advantages to the extent as JVs do. However, their use offers especially flexibility and the ability for speedy responses to unexpected events during collaboration. In addition, they are more effective for terminating a

relationship once objectives have been achieved or when the alliance does not deliver on its objectives. In addition, bilateral contracts are less costly as they do not involve exchange of equity nor do they entail (expensive) hierarchical control mechanisms and procedures (Gulati, 1995a). In sum, bilateral contracts, when compared to JVs, are quick to set-up, cheap to run and easy to terminate (Harrigan, 1988). However, they offer considerably less room for knowledge sharing and the build-up of trust that may help to mitigate collaborative risks (Gulati, 1995a). Below we discuss the role of alliance organization in more detail and specify its effect on changes in a firm's BC, through incentives, opportunities and ability.

*Incentives.* As argued above, JVs offer room for mitigating risks of spillovers and opportunism (Gulati, 1995a). These benefits may become particularly attractive when moving into a brokering position and getting linked to unconnected firms. Partnering with such disembedded firms may increase the risks and uncertainties of collaboration and expose a focal firm to a 'liability of strangers' (Baum et al., 2005). The use of JVs may enable a focal firm to address these elevated risks that come when collaborating with unconnected firms. In this way, the use of JVs may increase incentives to move into a brokering position.

*Opportunities.* As discussed, JVs come with substantial upfront investments. To be able to recoup these investments requires a certain duration of the collaboration. In addition, a certain duration also offers room to build up a common understanding between partners and to exchange more complex and tacit knowledge (Gilsing and Nooteboom, 2006), which further contributes to the exchange and recombination of knowledge between them (Sampson, 2007). In this way, the use of JVs may lead to the development of stronger ties between a firm and its partners over time, through repeated partnering (Gulati, 1995a). The stronger the ties with its partners, the higher the likelihood that a focal firm's partners also become directly connected (Chung et al., 2000), following Granovetter's idea of the 'forbidden triad' (1973) and Gulati's common partner argument (1999). More connectivity and higher density among a firm's partners will lead to a broader diffusion of a focal firm's knowledge and expertise among its partners, which may reduce the unique value of a firm's specific knowledge and expertise. For unconnected firms, this may lower the necessity to collaborate with the focal firm per se, as they may also have a focal firm's partners to turn to, instead of the focal firm itself. Overall, the more a firm relies on the use of JVs, the more likely that the number of opportunities diminishes.

*Ability.* On the one hand, a key strength of JVs is that they may support a firm in collaborating with highly diverse partners. More specifically, JVs support strong information flows between partners, which is especially relevant in alliances between partners with a high technological distance (Sampson, 2007). On the other hand, however, JVs are more costly and difficult to terminate rapidly once a collaboration does not live up to expectations and objectives. Hence, the more a firm makes use of JVs, the lower its ability to respond flexibly to new attractive opportunities for partnering with unconnected alters, which may emerge unexpectedly. In addition, the phenomenon that the use of JVs leads to stronger ties between partners over time (Gulati, 1995a) and may lead to a relatively closed group (Uzzi, 1997) also lowers the ability of a focal firm to hear rapidly about where new, valuable resources and attractive opportunities for partnering and/or brokering may rest throughout the network. Overall, despite the room that JVs offer in bridging a large technological distance with diverse partners, we expect that their lower flexibility and their reduction of a firm's ability to hear about new partnering opportunities will lead to a negative net-effect on a firm's ability to move into a brokering position.

In sum, whereas the use of JVs increases incentives, it reduces opportunities as well as the ability of firms for brokering across unconnected firms in the network. Therefore, we expect overall that the more a firm relies on the use of JVs, the less room for brokerage among unconnected alters that will lower its BC. This suggests our third hypothesis:

*Hypothesis 3: There is a negative relationship between a firm's use of equity-based alliances and an increase in its BC.*

#### **Pioneering technology and alliance organization**

We combine a competence and a governance perspective by considering the interaction between pioneering technology and alliance organization. The 'de-novo' character of pioneering technology may arouse strong interest by others, elevating the risk of spillovers. As the choice for a certain alliance organization may influence this risk, we consider to what extent the combination of pioneering technology and alliance organization leads to changes in a firm's BC through incentives, opportunities and ability.

*Incentives.* As discussed, the possession of pioneering technology may elevate a focal firm's incentives to move into a brokering position. However, brokerage through collaboration with

unconnected others may also increase a focal firm's exposure to collaborative hazards such as undesirable knowledge spillovers and free-ridership. To guard itself against these risks, JVs may form an effective instrument (Sampson, 2007). They may help to protect against spillovers and also allow for the build-up of trust between partners that may mitigate risks of freeridership (Gulati, 1995a; Nooteboom, 2004). In this way, the use of JVs in combination with pioneering technology may further elevate incentives for brokerage by a focal firm among unconnected partners.

*Opportunities.* As discussed, the possession of pioneering technology may yield opportunities to form alliances with unconnected partners. In contrast, the use of JVs may decrease such opportunities, as argued above. This makes it not straightforward to arrive at an unequivocal prediction. On the one hand, possessing pioneering technology in combination with the use of JVs may increase opportunities even further. The risk of undesirable spillovers and/or freeridership that we discussed above, will also be present from the perspective of the unconnected alter(s). From the latter viewpoint, the focal firm is also disembedded and may possibly be tempted to engage in acts of opportunism towards him. The latter may therefore be more willing to engage in collaboration when this takes place by means of JVs, with their potential to mitigate opportunism, rather than by contracts.

*Ability.* As already discussed, possession of pioneering technology may contribute to a firm's ability to ally with unconnected partners in the network, as it may support a focal firm in bridging a large technological distance between unconnected parts of the network. In combination with the use of JVs, this ability may get further strengthened as JVs are particularly effective when collaborating with technologically (highly) diverse partners (Sampson, 2007). As a consequence, the use of JVs in combination with pioneering technology may further amplify the ability of firms to collaborate with partners formerly unconnected to their ego-network, at a large technological distance. These benefits may possibly offset the disadvantages for their ability to move into a more central position, formed by lower flexibility and a reduced ability to hear about new opportunities due to the use of JVs, as discussed above.

In sum, we expect that pioneering technology in combination with the use of JVs further elevate incentives, opportunities and the ability of a focal firm to move into a brokerage position. Therefore, we expect that the room pioneering technology provides to a focal firm to move into a brokerage position, conform hypothesis 1, is further amplified when combined with the use of JVs. This suggests our fourth hypothesis.

*Hypothesis 4: There is a positive relationship between a firm's possession of pioneering technology and its use of equity-based alliances, and an increase in its BC.*

## 2 Methods

### 2.1 Data and sample

We present an analysis of a large sample of 1,697 companies, from 39 countries, with a total number of 3,124 technology alliances. The data on these technology alliances were obtained from the MERIT-CATI databank and cover the period 1990 - 2000. The MERIT-CATI databank contains information on thousands of technology-related inter-firm partnerships. Information is primarily collected on joint ventures with R&D activities and contractual technology alliances such as R&D pacts and joint development agreements (see also Hagedoorn, 2002). We study both types of alliances within two different networks. One network that is made up of biotechnology alliances and one network that is made up of alliances that fall within the broader ICT industry, formed by computers, semi-conductors and telecom.

There are several reasons for choosing these international high-tech sectors as the empirical setting for our study. First, these sectors are generally considered as high-tech sectors because of their R&D intensity, their patent intensity and their high level of new product development (OECD, 1997). Second, these industries are characterized by (broadly) distributed technological knowledge and skills, which creates a strategic necessity for firms to engage in R&D collaboration. As a consequence, interfirm collaboration is a widespread phenomenon in these industries as can be seen from the large number of companies that has engaged in joint R&D (Hagedoorn, 2002). Technological expertise, formed by pioneering technologies, as much as alliance portfolios contribute to a firm's reputation and its ability of having speedy access to external expertise, each of which are critical to firms' survival in high-tech industries (Powell et al., 1996; Gulati, 1999; Hagedoorn, 2002; Sampson, 2007). In addition, previous research has demonstrated that collaborative hazards are especially present in alliances involving technology (Gulati and Singh, 1998), suggesting that also a governance view of collaboration is useful

to consider and therefore the inclusion of alliance organization as a key independent variable that may affect a firm's centrality.

The composition of our sample shows a large degree of variation along different dimensions. Overall, 47% of these technology alliances are domestic, whereas 53% have an international scope. In addition, about one third of the companies in our sample are relatively small with less than 1,000 employees, whereas 25% can be characterized as very large with more than 50,000 employees and 42% of the companies can be considered as intermediate. With respect to R&D intensity, 25% of the companies have an R&D intensity of less than 5%, 22% spends more than 15% of their sales on R&D expenditures and about half of the sample (53%) can be found in intermediate classes. Concerning alliance experience, about 50% of the companies have undertaken 2 alliances or less up to 5 years in the past, around 25% has undertaken 2 to 10 alliances in the past, almost 15% undertook 11 to 20 alliances and 10 % was engaged in over 20 alliances. So, our sample shows sufficient variation regarding international coverage, the size distribution of companies, their R&D intensity and alliance experience.

Information on firms was collected through well-known databases such as Amadeus, Compustat, Disclosure, Osiris, and Worldscope. Data on patents and patent citations at the firm level are taken from the USPTO. Although the use of US data could imply a bias in favour of US companies and against non-US firms, the patent literature suggests several reasons to choose US patent data (see Patel and Pavitt, 1991). These reasons include the importance of the US market, the genuine patent protection offered by US authorities, and the level of technological sophistication of the US market, which makes it almost compulsory for non-US companies to file patents in the USA (Albert, Avery, Narin and McAllister, 1991). Furthermore, to maintain a certain level of consistency, reliability and comparability it is necessary to choose one patenting system instead of several patenting systems across nations (Ahuja and Katila, 2001).

Regarding network boundary specification, we have followed a commonly used approach of using a restriction based on some attribute or characteristic of the actors in the network (Laumann, Marsden and Prensky, 1992). More specifically, an *industry criterion* is applied to restrict membership in the network, as our target population includes only those focal companies that are active in one of the two high-tech industries as defined above. In addition, network boundaries are also set by a defining activity, i.e. *participation in technology alliances*, which serves to select individual actors and the relationship among them in the network. So, boundary specification of the network that we study is formed by alliances that focused on the creation of new technology in these industries. We collected our data by relying on both firms' announcements in industry specific trade journals, industry reports and articles as well as on data from the MERIT-CATI database, a comprehensive database that contains information on R&D partnerships (see e.g. Hagedoorn and Roijackers, 2002). As a consequence, other types of relations between firms that refrain from this, by for example including a focus on marketing or production, are left out from the analysis.

**2.2 Dependent Variable & Estimation Method**

Betweenness centrality (BC) is based on the geodesic paths between all pairs of actors and measured by determining the proportion of how frequently each actors falls in each of these pathways. The variable betweenness centrality (BC) is measured using UCINET VI (Borgatti, Evertt and Freeman, 2002). The betweenness centrality (BC) measure is as follows:

$$Cb(p_k) = \sum_l^n \sum_j^n g_{ij}(p_k)/g_{ij},$$

where n represents the number of points in the network,  $g_{ij}$  represents the number of geodesic paths linking  $p_i$  and  $p_j$  that contain  $p_k$ . This ratio measures betweenness centrality (BC) by adding up the number of times an actor is 'between' other actors and divide it by the maximum possible betweenness (Hanneman, 2001).

The variable betweenness centrality (BC) is highly skewed and, accordingly, the pattern observed in the empirical distribution is better represented by lognormal distributions (see also Laursen and Salter, 2005). More specifically, if heteroscedasticity and/or non-normality are detected, a transformation of the dependent variable is appropriate. As this was the case, we have log-transformed this variable, changing our focal dependent variable into *changes* in betweenness centrality. More specifically, by taking the logarithm of the dependent variable, the explanatory variables have an impact in terms of the amount of percentual change in a firm's BC, i.e. the elasticity is obtained. However, a lognormal transformation neither changes the signs nor the significance of parameters for the key variables in the empirical analysis. We come back to this issue when we present the descriptive statistics of our sample and discuss

whether the conditions of heteroscedasticity and/or non - normality have been met sufficiently indeed.

The natural logarithm of betweenness centrality (BC) only takes non-negative values. Non-negative variables violate one of the main assumptions of the classical linear (OLS) regression model as the dependent variable cannot be normally distributed. The Tobit model is an econometric, biometric model proposed by Tobin (1958) to describe the relationship between a non-negative dependent variable  $y_i$  and an independent variable (or vector)  $x_i$ . Because our data contains variables observed over multiple time periods for the same companies, we use panel tobit analysis.

### 3.3 Independent variables

For the variable pioneering technologies we need a measure that captures the degree to which a firm experiments with technologies that build on no prior technologies. In line with Ahuja and Lampert (2001), this variable is computed as the number of a firm's patents that cite no other patents. Patents must indicate their prior technological lineage by citing all patents that they build on (Podolny and Stuart, 1995; Stuart and Podolny, 1996; Jaffe, Trajtenberg, and Henderson, 1993; Trajtenberg, Henderson, and Jaffe, 1992). Patents that cite no other patents indicate that they have no discernible technological antecedents. Past research has used the relative lack of prior art citations in a patent as an indicator of the *originality* and *creativity* of that patent (Ahuja and Lampert, 2001; Trajtenberg et al., 1992). According to Ahuja and Lampert (2001), the creation of many such patents by a firm reflects its willingness to adopt a pioneering or unprecedented approach in its innovation strategy. Thus, firms that create many patents that cite no other patents are firms that can be regarded as willing to explore technology spaces that have not been explored before. Yearly data on patents and patents citations at the firm level are taken from the USPTO.

The variable portfolio size (PS) is measured by counting the number of different partners with whom a company has collaborated through a technology-based alliance within one year. The variable portfolio size squared is measured by taking the squared term of the variable portfolio size. This variable is included in order to take into account curvilinear effects of portfolio size, in line with the literature (Add REFs).

The variable alliance organization (JV) is measured by taking the degree of joint ventures in the total number of technology partnerships in which a company engages per year.

We also include an interaction effect into the analysis. The variable interaction PT and JV is constructed by multiplying the variable pioneering technologies with the variable alliance organization. Before calculating the interaction term we mean-centred the variables (Aiken and West, 1991) in order to reduce the risk of multicollinearity with the original independent variables.

Furthermore, all independent variables and their interaction terms are lagged for one-year in order to allow for a causal effect on the dependent variable.

### 3.4 Control variables

Consistent with prior research on inter-firm partnerships, we included a number of control variables for specific company characteristics and for some general characteristics of the sectors from which these companies originate.

Technological capital is included as a control variable because it may affect its incentives, opportunities and ability for brokering across unconnected partners. Although it generally may increase opportunities and ability, it may not necessarily increase its incentives due to elevated risks of spillovers. Technological capital will be measured by counting the number of applied US patents each company received per year.

Alliance experience is included as a control variable because firms with more alliance experience have more alliances and thereby may have more partners. These firms may enjoy more opportunities to become more central and we therefore control for this effect. The variable alliance experience refers to the amount of alliance experience that a firm has acquired over the years. In line with the literature, it is measured by a count of a firm's past alliances using a five-year moving window from  $t-5$  to  $t-1$  (Kale and Singh, 1999; Heimeriks and Duysters, 2007). A moving window of five years is considered as an appropriate time frame as the average life-span for alliances is about five years (Kogut, 1988; Gulati, 1999).

The size of a company is included as a control variable because larger firms may have more alliances and/or more partners. As a consequence, larger firms may have wider-reaching industry contacts that may lead to more extensive networks and therefore to possibly better or earlier information on alliance opportunities (Eisenhardt and Schoonhoven, 1996). Seen in this way, larger firms may enjoy more opportunities to become more central than smaller firms and we therefore control for this effect. Firm size is measured in terms of the natural logarithm of the number of employees of a company. R&D

intensity of companies is taken as a control variable as it may indicate the degree of a firm’s absorptive capacity (Cohen and Levinthal, 1990). High absorptive capacity strengthens the ability of firms to recognize the value of highly novel and technologically distant knowledge, which may enable them to collaborate with partners from distant parts of the network. In this way, absorptive capacity may affect the incentives and/or ability of a firm to increase its BC. The variable R&D intensity is measured by a company’s R&D expenditures divided by its sales (standardized by converting the data from national currencies to US dollars).

We also control for differences in a firm’s innovation strategy, emphasizing an exploitation strategy versus a more exploration-oriented strategy. An exploitation strategy can be associated with deepening one’s expertise in a limited area and may provide firms with different incentives, opportunities and/or abilities to search for external knowledge and change its position in the network then firms pursuing an exploration strategy, which may be associated with broadening its knowledge base over different domains. Inclusion of both depth and scope of a firm’s knowledge base enables us to control for these two potential sources of heterogeneity that may potentially affect our dependent variable. In line with Katila and Ahuja (2002), the variable depth is measured by counting how often each citation in the current patents has occurred before (how much the firm exploits existing knowledge) whereas the variable scope is measured by counting how many of the current citations have never occurred before (how much a firm explores new knowledge in its innovation search).

We also control for the role of exogenous factors that could affect a firm’s room to become more central. First, the role of the entire network structure may play a role. Here, we consider the variable network centralization that refers to the overall centralization of the network and is indicative of the tendency of one or a few firms to be more central than others in the network (Freeman, 1979). In this respect, network centralization provides an aggregate measure for the distribution of ties among firms and in this way for the degree in which they are differentiated in terms of their structural position (Madhavan et al., 1998). A more centralized network may provide different incentives and opportunities than a non-centralized network. For example, the more centralized a network is, the fewer opportunities a focal firm may have to become more central, whereas a less centralized network may offer more opportunities to become more central. We computed the network centralization index by the use of UCINET VI to measure the centralization of the entire network (Borgatti, Everett and Freeman, 2002). Second, we control for differences between both sectors by including the variable dummy pharmaceuticals, which is coded 1 for the pharmaceutical sector (including biotech) and 0 for the ICT-sector (computers, semi-conductors and telecom).

Finally, as for the independent variables, all control variables are lagged for one-year in order to allow for a causal effect on the dependent variable.

### 3 Results

Table 1 presents the descriptive statistics (means and standard deviations) and correlations of the dependent and explanatory variables. There are no correlations between the main independent variables that are higher than 0.5 (Hair et al, 1995)<sup>1</sup>. Overall, there do not exist any problems with multicollinearity in our analysis. In addition, table 1 shows high variation for our three independent variables (pioneering technologies, portfolio size and alliance organization), indicating that there is a large degree of heterogeneity among firms in our sample regarding the key independent variables of interest.

**Table 1 Descriptive statistics and bivariate correlations for all variables of the panel tobit analyses<sup>2</sup>**  
(*N* = 3,124; *nr of firms* = 1,697; *years* = 1990-2000)

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 ln(Betweenness centrality)	1.29	2.44	1.000													
2 Pioneering technologies (PT)	2.78	8.66	0.259	1.000												

<sup>1</sup> Although there is little correlation between the main independent variables, an expected exception is the correlation between portfolio size (PS) and portfolio size squared. There is also some expected correlation between pioneering technologies (PT) and the interaction effect of pioneering technologies with alliance organization (PT \* JV).

<sup>2</sup> For readability, the descriptive statistics are given for the uncentered variables. If we represent the descriptive statistics for the mean-centered variables, certain count variables such as technological capabilities and portfolio size, would get a negative mean, which is counter-intuitive.



3 Portfolio size (PS)	0.89	1.99	0.436	0.325	1.000												
4 PS squared	4.76	19.39	0.324	0.273	0.894	1.000											
5 Alliance organization (JV)	0.14	0.32	-0.335	-0.145	-0.204	0.292	1.000										
6 Interaction PT and JV	-0.01	0.07	-0.166	-0.685	-0.196	-0.167	0.473	1.000									
7 Technological capital	54.54	184.59	0.315	0.342	0.467	0.441	-0.126	-0.118	1.000								
8 Alliance experience	6.11	8.29	0.356	0.306	0.443	0.318	-0.176	-0.132	0.419	1.000							
9 Size	8.43	2.72	0.288	0.243	0.363	0.292	-0.159	-0.172	0.466	0.488	1.000						
10 R&D intensity	0.68	7.91	-0.035	-0.022	-0.024	-0.022	0.015	0.012	-0.034	-0.072	-0.225	1.000					
11 Depth	0.43	12.75	0.037	0.010	0.027	0.006	0.007	0.003	0.013	0.039	0.022	-0.005	1.000				
12 Scope	0.34	0.40	0.185	0.142	0.225	0.156	-0.098	-0.095	0.249	0.323	0.279	-0.043	-0.002	1.000			
13 Network centralization	0.49	0.21	-0.035	-0.047	-0.059	-0.023	-0.007	0.005	0.006	0.012	0.162	-0.034	-0.001	0.012	1.000		
14 Dummy pharmaceuticals	0.56	0.50	0.001	0.058	-0.081	-0.098	0.026	-0.017	-0.221	-0.151	-0.352	0.075	-0.147	0.022	-0.033	1.000	

If both heteroscedasticity and non-normality are detected, then a transformation of the dependent variable may be appropriate. We checked for omitted variable bias and other possible confounding effects through the inspection of the possibility of heteroscedasticity. Since the standard test for heteroscedasticity is not applicable in the case of a panel tobit, we use a bootstrap procedure. Bootstrapping typically generates very conservative results.<sup>1</sup> Since our results remained very robust when using the bootstrap procedure (i.e. the same results in terms of sign and significance of the beta coefficients), this indicates that we both have included the most important factors affecting BC and also that our estimators are not biased and there is no problem of heteroscedasticity. However, the skewness of our dependent variable violates the assumption of normality of residuals in the standard Tobit model so that a log transformation of our dependent variable is appropriate.

**Table 2 Estimation results of the panel tobit analyses<sup>11</sup>**

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	-9.947***	-9.7601***	-9.1171***	-8.3746***	-7.2627***
	(1.2075)	(1.3232)	(1.0806)	(1.1036)	(1.1186)
Pioneering technologies (PT)		0.0490***			0.0814***
		(0.0162)			(0.0221)
Portfolio size (PS)			0.9018***		0.7372***
			(0.1820)		(0.1668)
Portfolio size squared			-0.0566***		-0.0491***
			(0.0141)		(0.0130)
Alliance organization (JV)				-0.0047***	-0.0059***
				(0.0006)	(0.0007)
Interaction PT and JV					0.0001***
					(0.0000)
Technological capital	0.0030***	0.0024**	0.0030***	0.0027***	0.0018**
	(0.0011)	(0.0011)	(0.0009)	(0.0006)	(0.0009)
Alliance experience	0.0819***	0.0528	0.0464	0.0810***	0.0283
	(0.0318)	(0.0334)	(0.0285)	(0.0293)	(0.0285)
Size	0.6170***	0.6878***	0.5184***	0.5283***	0.4558***
	(0.1300)	(0.1432)	(0.1158)	(0.1200)	(0.1220)

<sup>1</sup> The option vce(boot) in stata controls for within group serial correlation and over-dispersion. Furthermore, it can be used to bootstrap the standard errors. The bootstrap is typically used for consistent but biased estimators.

<sup>2</sup> CV = all the control variables.

R&D intensity	0.0001	0.0034	0.0001	-0.0001	0.0021
	(0.0011)	(0.0023)	(0.0011)	(0.0011)	(0.0021)
Depth	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Scope	0.8441	0.2546	0.6650	0.8131	0.0129
	(0.5425)	(0.5887)	(0.5109)	(0.5126)	(0.5388)
Network centralization	-0.0002	-0.0002	0.0000	-0.0003	0.0000
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Dummy pharmaceuticals	2.4599***	2.0217***	2.0409***	2.1663***	1.3039***
	(0.4884)	(0.5170)	(0.4369)	(0.4520)	(0.4442)
Log likelihood	-1,829***	-1,658***	-1,815***	-1,733***	-1,562***
Wald chi-squared	109.23***	102.57***	168.80***	174.38***	218.38***

Table 2 presents the results of the panel tobit analysis with the dependent variable measuring the percentage change in a firm’s centrality. We used a stepwise approach to arrive at our results. Model 1, the base model, only contains the control variables and a constant. Model 2, 3 and 4 also include the variable pioneering technologies, portfolio size and alliance organization respectively. Our final model is number 5 that contains all variables, i.e. our full model. The table indicates that our results are very robust, i.e. all main independent variables have the same signs and the same significance in all of the models. Furthermore, the size of the coefficients of all variables is comparable for all models. Because we have panel tobit models, the goodness-of-fit of the different models can be evaluated using the log likelihood values and a Wald test. As can be seen in the table, model 2, 3 and 4 all have significant higher log likelihood values compared to the base model, model 1. Also, model 3 and 4 have significant higher values for the Wald test compared to the base model. This indicates that model 3 and 4, and to a lesser extent model 2, carry more explanatory power in explaining betweenness centrality (BC) than the base model, model 1. Furthermore, the full model has the highest significant log likelihood values and Wald chi-squared values, indicating that the full model is the best in explaining betweenness centrality (BC) out of all models. Because of the robustness of the results, we will only discuss the results of the full model (model 5).

The possession of pioneering technologies (PT) has a highly significant and positive effect on a firm’s betweenness centrality (BC). This provides support for hypothesis 1, suggesting that pioneering technologies carry a positive effect on incentives, opportunities and ability for brokering across unconnected partners and thus lead to an increase in betweenness centrality.<sup>1</sup> Hypothesis 2 specifies a curvilinear effect of a firm’s portfolio size (PS) on incentives, opportunities and ability to move into a brokering position. Here, the results in table 2 show a highly significant positive linear coefficient and a highly significant negative quadratic coefficient, indicating that portfolio size indeed carries the predicted curvilinear effect. The variable alliance organization (JV) has a highly significant, negative effect on our dependent variable. This provides support for hypothesis 3, predicting that the use of equity-based alliances reduces a firm’s betweenness centrality. Moreover, an additional observation pertains to the differences in the size of the effects of our three independent variables. The effect of portfolio size is larger when compared to the effect of pioneering technologies and far larger than alliance organization, an issue that we will discuss more in-depth in the discussion and conclusions section.

Regarding the interaction effect, hypothesis 4 predicts that the interaction between pioneering technologies and alliance organization will increase a firm’s betweenness centrality. The coefficient of the interaction between pioneering technologies and alliance organization carries the predicted positive sign and is highly significant, indicating strong support for hypothesis 4.

We also controlled for technological capital, alliance experience, firm size, depth and scope, network centralization and differences between sectors of industry<sup>2</sup>. Technological capital is significant

<sup>1</sup> We also tested for a possible (not predicted) curvilinear effect of pioneering technologies. However, the squared term proved to be insignificant.

<sup>2</sup> Since the study period from 1990 to 2000 covers 11 years of observation, we also included annual dummies and a trend variable to test for a structural break in the univariate time series of our dependent variable. However, the

and has a positive effect on a firm's betweenness centrality. However, its significance is weaker compared to the significance of pioneering technologies. Furthermore, the coefficient of technological capital is much smaller than the one of pioneering technologies. So, although technological capital does have a significant positive effect on betweenness centrality, pioneering technologies have a stronger and more significant effect on betweenness centrality. Alliance experience is not significant in the full model, although it has a highly significant positive effect in model 1 and 4, suggesting that more alliance experience positively effects a firm's betweenness centrality. Firm size is highly significant and has a strong effect on a firm's betweenness centrality. R&D intensity does not seem to play an important role, the results don't show any significant effect. Furthermore, the absence of any significant effect of both depth and scope indicates that underlying differences between firms' innovation strategies do not affect their incentives, opportunities and/or ability to become more central. Although the role of network centralization carries the expected negative sign, it does not have a significant effect. Finally, we controlled for differences between sectors of industry. Dummy pharmaceuticals shows a highly significant and positive effect, indicating that the volatility in betweenness centrality (BC) in the pharmaceutical sector (including biotech) is higher compared to the ICT sector (computers, semi-conductors and telecom).

As an additional robustness check we ran the same analyses by using degree centrality instead of betweenness centrality (BC) as the dependent variable<sup>1</sup>. Again, we used a stepwise approach to arrive at our results. In general, the results show that the effects of the independent variables are less significant when using degree centrality as dependent variable. In case the results were significant when using degree centrality, the coefficients were smaller. These results seem to suggest that pioneering technologies, portfolio size and choice for alliance organization play a far more important role in changing a firm's BC compared to its degree centrality.

Finally, we also tested for endogeneity due to reverse causality, following suggestions and evidence in the literature that centrality affects different types of outcomes (Burt, 1992; Powell e.a., 1996). One such possibility may be the effect of centrality on a firm's innovation performance (Ahuja, 2000a; Gilsing et al., 2008), suggesting the possibility of a reverse effect of centrality on the build-up of a firm's pioneering technologies, forming one of our key independent variables. Likewise, centrality may affect the opportunities to form linkages (Podolny, 1994), suggesting the possibility of a reverse effect of centrality on the build-up of a firm's portfolio size. Centrality may also affect the propensity to employ certain governance modes. Being more central may possibly reduce the need for equity-based collaboration as such a powerful position may also offer alternative ways to mitigate opportunism, e.g. by threatening with negative referrals.

Based on two tests in Stata, we found no endogeneity in our sample.<sup>2</sup> One should bear in mind that our dependent variable is formed by *changes* in BC, suggesting that a change in one's position does not affect a firm's pioneering technologies, portfolio size or use of equity over non-equity alliances, at least not on the short term. This further enhances confidence in our empirical findings and also indicates that endogeneity does not form an issue in our study in contrast to empirical studies where the dependent variable is performance-based (Hamilton and Nickerson, 2003; Lee, 2010).

In sum, we find empirical evidence for all four hypotheses whereas our tests rule out the possibility of endogeneity. Overall, this lends credence to the central argument made in this paper that the joint consideration of incentives, opportunities and ability enables us to develop a more comprehensive understanding of how heterogeneity in firm-level attributes, i.e. their pioneering technologies, portfolio size and choice for alliance organization, drives differences among firms regarding changes in their BC.

#### 4 Discussion and Conclusions

Although central positions have been associated with above average performance of firms (Burt, 1992; 2000; Galaskiewicz, 1979; Krackhardt, 1990; Powell et al., 1996; Stuart, 1998), an understanding of the process along which firms come to occupy a more central position still remains underdeveloped. To address this, the aim of this paper has been to develop an endogenous understanding of changes in centrality by considering the role of pioneering technology, portfolio size and the choice for alliance organization as firm-level antecedents. Following our hypotheses and empirical findings, there are a

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results of the annual dummies and the trend variable were non-significant.

<sup>1</sup> The results of the analyses with degree centrality as dependent variable are available from the authors upon request.

<sup>2</sup> More specifically, the `.ivreg2` command computes a single-equation instrumental-variables regression and the `.ivendog` command computes a test for endogeneity in a regression estimated via instrumental variables.

number of results that stand out.

First, pioneering technology, portfolio size as well as alliance organization form relevant antecedents of changes in a firm's BC. For pioneering technology we found a positive effect, for the role of alliance portfolio we found a non-linear (curvilinear) effect, whereas for the use of equity alliances we found a negative effect. Second, when considering the interaction effect, we found that the use of JVs (contracts) amplifies (mitigates) the positive effect of pioneering technology. Third, the relative importance of each of the three antecedents differs substantially among them. The role of alliance portfolio size is by far the largest (73%) and is followed by pioneering technology (8%), whereas the role of alliance organization is very limited (0,5%) as is the combination of pioneering technology and the use of JVs (0,01%). We advance an interpretation for this difference in effect sizes below.

The large effect of portfolio size is in line with some key insights as they have emerged in the literature. A sizeable alliance portfolio may signal that a firm is well embedded and possesses status, both of which may contribute to a firm's 'natural right' to initiate partnerships with what it considers as attractive others (Podolny, 1994; Gulati, 1995b). This is in line with the logic of preferential attachment that leads to a dynamic of 'the rich-get-richer' (Powell et al., 2005) as well as with the common idea of a persistent, endogenous network dynamic that leads to replication and incremental change of the network structure over time (Gulati and Gargiulo, 1999). The prominent role of these pervasive mechanisms in alliance networks accounts for the large effect of alliance portfolio as an antecedent of centrality as found in this study. Still, if this serves to explain why the effect of alliance portfolio is readily apparent, a question that still remains is why the role of pioneering technology and most notably alliance organization are relatively small?

The (highly significant) individual effect of pioneering technology does demonstrate that firms in possession of pioneering technology, irrespective of the size of their alliance portfolio, may end up in a more central position than they initially occupied. This is in line with the idea that peripheral players can become more central if they possess valuable technological expertise (Ahuja 2000a; Gulati and Gargiulo, 1999; Oscan and Eisenhardt, 2010), and that they may be more inclined to ally with attractive, central others rather than with peripheral 'peers' conform the notion of structural heterophily (Ahuja et al., 2009). So, our findings also provide evidence for the possibility of potentially poorly embedded firms with valuable pioneering technology that can ally with more central players if they can offer pioneering technology that can not be obtained from others (Ahuja et al., 2009). As this forms the 'exception to the rule' (Gulati and Gargiulo, 1999), however, the size effect of pioneering technology is comparatively smaller than for alliance portfolio size.<sup>1</sup>

Regarding the relatively small effect of alliance organization, there may be different interpretations. First, we argued theoretically that whereas the use of JVs may increase incentives, it may also reduce opportunities as well as the ability of firms for brokering. These opposed effects may to some extent cancel out on each other and lead to a net-effect on BC that is very limited in size. Second, we reiterate that the key premise underlying our logic is formed by one of the core ideas in social exchange theory, namely that an actor (firm) must have something of value to offer in order to become or stay attractive to others (Blau, 1964; Emerson, 1962; Robinson and Stuart, 2006). Seen in this way, alliance organization as such does not create or increase the value of what firms have to offer, but rather affects the degree in which value can be protected and thus be maintained. So, the role of alliance organization is of more secondary importance and therefore makes less of a difference when compared to alliance portfolio and pioneering technology. A third interpretation may be that too much emphasis on protecting its possessions will reduce a firm's attractiveness to others and therefore will only have a very limited effect on an increase in its BC. This seems in line with the very marginal effect of the combination of pioneering technology and the use of JVs. This suggests that possession of pioneering technology asks to be shared with others if one aspires to increase one's BC. A firm can still choose to protect its pioneering technology through the use of JVs, but then has to accept that it pays a price by a lack of an increase in its BC.

Overall, our study contributes to an understanding of what makes firms more central in technology-based alliance networks. This serves as an important complement to exogenous explanations that have been advanced until now, such as changes in technology and regulation (Madhavan et al., 1998)

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<sup>1</sup> This is in line with the findings by Rosenkopf and Padula (2008) on the formation of 'short-cuts', i.e. ties to (semi) distant firms that may possess unique expertise. Such short-cuts, however, form the less common ties and their value lies 'not in their prevalence but in their scarcity' (Rosenkopf and Padula, 2008: 3).

or changes in environmental conditions (Koka et al., 2006). Although such exogenous explanations can predict aggregate changes in network centrality, they remain silent on an endogenous understanding of how individual firms can come to occupy a more central position. Our study shows that how they can, will be different for different firms. Heterogeneity in firm-level attributes such as their pioneering technology, alliance portfolio size and the use of equity-alliances drives differences among firms in increasing their BC. The mechanisms *through which* each of these affect the room for firms to alter their network position are formed by (1) incentives, (2) opportunities and (3) ability. This joint consideration of both incentives, opportunity and ability is more comprehensive than earlier studies that carried a (implicit) focus on opportunities only (Burt, 1992; Madhavan et al., 1988), opportunities and ability (Burkhardt and Brass, 1990; Lee, 2010) or opportunities and incentives (Shipilov et al., 2010). It is the combination of these three mechanisms and a firm's possession of technological and social resources, and its alliance governance choices, that influence changes in their BC. By considering these antecedents of changes in centrality, we also inform the literature what factors affect and shape networks (Gilsing and Nooteboom 2006; Koka et al., 2006; Madhavan et al., 1998; Rosenkopf and Schilling, 2007). This goes beyond the dominant focus on the role of network structural properties as independent variables and explores the role of firm-level factors that affect and shape these properties.

Secondly, we contribute to an emerging debate in the literature regarding the role of agency in networks. Network research has been criticized for failing to show how actors' intentional action may contribute to the creation of network structures that constrain them at the same time (Emirbayer and Goodwin, 1994; Kilduff and Brass, 2010; Salancik, 1995). Most studies until now have assumed that network structure is exogenous, implicitly suggesting as if firms' network positions are given (Lee, 2010). This view can be criticized as one can also argue that firms may be motivated and capable to pursue certain network positions in anticipation of their performance benefits. What follows from our logic and empirical findings is that the role of incentives, opportunities and ability suggests that firms are deliberately after achieving collaboration with hitherto unconnected partners, implying purposeful behavior. However, what also emerges from our study is that firms may not be pursuing the most central position per se, but rather are interested in collaboration with what they consider as an attractive, unconnected partner. It is foremost collaboration with these partners that is what drives firms, leading them to end up in a more central position as a result. At the same time, there remains a clear uncertain element in this process. Changes in a firm's BC also depends on other collaborative actions going on throughout the entire network that together make up for a (possible) redistribution of positions across firms. Obviously, these network level processes are beyond the control of individual firms and create a certain degree of unpredictability or randomness. Seen in this way, our study suggests that actors' intentional action definitely matters and contributes to the (re)creation of network structures and positions but that there also remains an exogenous process that puts a ceiling on this role of agency in networks.

The implications for managers and firms are that they may have more room to influence their BC in a network than previously assumed in the literature, but not to the extent that they can control this process. The development of a sizeable portfolio of direct partners (around 9 partners), the creation of pioneering technology and the reliance on contracts relative to JVs, in this order, will be supportive for moving into a more central position. But the actions of others in the network as well as (unforeseen) exogenous events will also have their share.

Although this study does reveal some very important aspects of the antecedents of changes in centrality in technology-based alliance networks, it also comes with a number of limitations.

Issues for future research may be as follows. First of all, there is still a clear need for further studies based on a larger variety of forms of inter-firm partnering. Collaboration that covers marketing or production and supply alliances may generate a(n) (entirely) different dynamic than a sole focus on technology alliances as considered here. In how far does possession of pioneering technology still form a relevant antecedent in e.g. a production & supply setting of collaboration where stability and predictability may be much more valued partner attributes than breakthrough expertise? Also governance trade-offs may be made rather differently in these settings and therefore show a different role of JVs versus contracts as found in this study. Another direction for future research may be to consider a broader range of industries such as medium- and low-tech sectors. The question is in how far the antecedents as considered in this study play a role in such different kinds of settings as well. There may be different antecedents that drive heterogeneity among firms in moving into more central positions. Finally, an interesting issue for future research may be to explore in-depth within firms how they actually deal with increasing their BC. Does this require different alliance and/or portfolio capabilities

than has been considered in the literature until now?

We started this paper with an overlooked and intriguing question, namely what makes firms more central in a global, technology-based alliance network? Overall, our study demonstrates that this begins with an appreciation of the role of ‘having path-breaking ideas’ (pioneering technology), ‘how many partners you have’ (portfolio size) and ‘how you organize this collaboration’ (alliance organization) that affects the degree in which firms come to occupy a more central position in a global network structure of technology-based alliances.

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## Between Learning and Competence: The Effect of Alliance Portfolio Diversity on Learning Equilibrium

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**Abstract :** This paper engages with the recent turn in alliance studies to adopt a portfolio approach. Specifically, we seek to increase our theoretical understanding of how the composition of a focal firm's alliance portfolio in terms of diversity affects its exploitation/ exploration equilibrium. Our analysis suggests that alliance portfolio diversity results in different outcomes for both explorative and exploitative learning, making it difficult to establish the optimal degree of diversity. Analogue to the concept of domain separation, we forward the idea of establishing different degrees of diversity across various domains as a potential solution to this issue.

**Key words:** Alliance portfolio; Exploration; Exploitation; Diversity

### 1 Introduction

Learning and innovating through alliances is considered a critical element in ensuring organizational competitiveness and innovativeness, a challenge increasingly met from an alliance portfolio perspective (Wassmer, 2008). A recurrent problem in both practice and theory revolves around the fundamental issue of addressing both knowledge exploration and exploitation simultaneously (Holmqvist, 2003). Knowledge exploitation allows organizations to acquire "reliability in experiences", leading to increased "productivity, refinement, routinization, production, and elaboration of existing experiences" (*ibid.*: 99). Knowledge exploration, conversely, allows organizations to develop "variety in experiences" (*ibid.*) by experimentation and innovation, thus complementing the limitations of knowledge exploitation. To date, it remains unclear how this equilibrium in exploitative and explorative learning is to be achieved by means of an alliance portfolio approach, such that both explorative and exploitative learning are optimally produced.

When engaged in alliance portfolio management in the face of exploration and exploitation optimization, an organization is confronted with the challenge of designing optimal portfolio diversity. It is agreed that, for either explorative and exploitative learning to thrive, different degrees of portfolio diversity is required (Simsek, 2009; March, 1996). More specifically, literature on alliance portfolio diversity portrays an interesting trade-off: one perspective advocates the great possibilities that stem from building highly diversified alliance portfolios, such as broadened search options and an enriched resource pool (Jiang *et al.*, 2010), resulting in better capabilities for developing new opportunities. The other perspective, however, stresses the potential drawbacks of an increase in portfolio diversity, such as more complexity, potentially more conflicts, and an increase in coordination costs (*ibid.*; Khanna *et al.*, 1998). The main problem lies in the notion that an alliance portfolio geared towards explorative learning goes at the expense of exploitative learning, leading towards a so-called learning trap. An alliance portfolio geared towards exploitative learning goes at the expense of explorative learning, leading towards a competence trap. Managing alliance portfolio diversity can result in a more balanced portfolio but inherently results in sub-optimal performance in terms of exploration and exploitation outcomes (March, 1996). The question, thus, remains how alliance portfolios should be designed from a diversity point-of-view, in order to produce superior exploitative *and* explorative learning.

This paper provides a conceptual solution by distinguishing different domains of diversity, suggesting that maximum levels of explorative and exploitative learning can be attained by the focal firm by managing alliance portfolio diversity across domains. This examination, which is developed analogue to the concept of domain separation (Lavie & Rosenkopf, 2006), is explored by means of two stylized solutions, one developing a parallel design while the other explores a 'core-crust' design. Doing so, we regard explorative learning and exploitative learning as our two dependent variables, whereas we consider three domains of portfolio diversity as independent variables. The trade-off between the two, which is central to March's (1991) framework (Lavie, Stettner & Tushman, 2010), can be regarded as learning equilibrium, which is achieved by different combinations of portfolio diversity domains. The combinatory effects of different types of alliance portfolio diversity on the balance in exploitative and explorative learning by the focal firm, thus, is of central importance to this study.

The contribution of this study is twofold. First, we explicitly address the issue of alliance portfolio diversity in relation to exploration and exploitation outcomes. This results in an increased understanding of the merits and drawbacks of a diversity approach. Second, we specifically concentrate on the multidimensional nature of alliance portfolio diversity, and advance alliance portfolio literature by postulating its interactive nature in relation to explorative and exploitative outcomes at the level of the focal firm. In so doing, this paper acknowledges the inherently problematic issue of reaching optimal exploration and exploitation outcomes while engaged in the struggle for some sort of exploration/exploitation equilibrium.

This study will proceed as follows. First, the topic of learning equilibrium is introduced by drawing on the issue of seeking a balance between knowledge exploration and exploitation. Subsequently, it is theoretically explored how alliance portfolio diversity matters with respect to reaching a state of knowledge exploration and exploitation. Third, it is explored how different types of diversity interact, thus mitigating or reinforcing one another's effect on exploration and exploitation outcomes.

## 2 Theoretical Background

### 2.1 The issue of learning equilibrium

The distinction between knowledge exploration and exploitation (March, 1991) is seminal to the issue of learning equilibrium, which can be defined as a status quo in which inter-firm knowledge exploration and exploitation is balanced to a degree that allows the focal firm to maximize its benefits from both learning processes. The exact equilibrium necessary to be achieved is dependent on the specific context. However, both processes can be regarded to produce a trade-off effect, meaning that one exists at the expense of the other.

Exploitative learning serves the purpose of refining and extending existing technologies or capabilities. As such, the focus is on learning as a routinized process by building on the current knowledge base and supporting the current nature of the firm's activities (Hagedoorn & Duysters, 2002). Explorative learning, by contrast, is characterized by search and experimentation, and focused on exploring new technologies or potential opportunities. It involves a non-routinized, discontinuous (Simsek, 2009) type of learning, and potentially effects the firm's current competencies and knowledge base significantly (March, 1991). Explorative learning processes are, subsequently, to be considered very different from its exploitative counterpart, especially when it comes down to degree of experimentation, duration, and certainty.

Reaching some sort of equilibrium is considered key, and indeed, fundamental to organizational survival and long-run adaptation (Gupta, Smith & Shalley, 2006). The logic behind this is straightforward; an organization exclusively engaged in explorative behavior will inevitably gain little returns from its explorative knowledge, while an organization predominantly engaged in exploitative behavior will inevitably suffer from an obsolescent body of knowledge (Levinthal & March, 1993). In essence, this dilemma revolves around focusing on improving an organization's short-term performance through exploitation on the one hand, or increasing an organization's long-term adaptability through exploration on the other (Phelps, 2010). Some degree of knowledge exploration, thus, is deemed necessary to overcome the hazards of knowledge exploitation, and *vice versa*. Although both knowledge exploration and exploitation processes were initially considered from an intra-organizational perspective (March, 1991), it is increasingly commonplace to regard both processes from an inter-organizational or alliance perspective (Holmqvist, 2003; Lavie & Rosenkopf, 2006).

In seeking learning equilibrium, complicating factors are likely to arise. March (1991) even regards knowledge exploitation and exploration fundamentally incompatible, a position for which he provides three basic arguments. First of all, exploration and exploitation compete for the same set of organizational resources, which are by definition limited (*ibid.*; Gupta *et al.*, 2006). But more interestingly, both types of knowledge behavior are sensitive to reiteration behavior, meaning that knowledge exploration behavior is likely to lead to more knowledge exploration while knowledge exploitation behavior is likely to lead to more knowledge exploitation (*ibid.*). Organizations, thus, need to be aware of the danger of getting excessively involved in either type of knowledge behavior. Third, knowledge exploration requires a very different mindset compared to that of knowledge exploitation. Or, as March puts it, "exploiting interesting ideas often thrives on commitment more than thoughtfulness, narrowness more than breadth, cohesiveness more than openness" (1996: 280). Exploration is to a greater degree associated with "flexibility, decentralization, and loose cultures", whereas exploitation is associated with "efficiency, centralization, and tight cultures" (Jansen *et al.*, 2009: 797). These

fundamental differences invoke organizations to overly specialize in either one of both types of knowledge behavior. Levitt & March (1988) already recognized this mechanism, terming it competency trap, preventing organizations from reaping the benefits of either knowledge exploration or exploitation processes. In this paper we refer to the process of organizations specializing too much in knowledge exploration as a ‘learning trap’, and the process of organizations specializing too much in knowledge exploitation as a ‘competency trap’.

Combining exploration and exploitation therefore can be thought of as a challenging and hazardous undertaking, requiring constant moderation and effort by a focal firm’s management. Even more so since both types of knowledge behaviors increasingly take place in the inter-organizational domain, like in the case of learning alliances. Collaboration with other firms is considered to facilitate learning by providing access to new knowledge residing externally (knowledge exploration), and/ or by teaming up in leveraging existing knowledge (knowledge exploitation) (Lavie & Rosenkopf, 2006). Learning alliances, thus, can serve as vehicles of learning through knowledge transfer and development as well as vehicles of value creation through knowledge utilization (Bernard Nielsen & Nielsen, 2009; Hoffmann, 2007).

### 2.2 Alliance portfolios and learning equilibrium

In general, a firm’s alliance portfolio encompasses both standalone alliances and collaborative networks (Parise & Casher, 2003), of which the latter can be thought of to take form as a clique-like structure in a firm’s overall alliance portfolio (Rowly, Baum, Shipilov, Greve & Rao, 2004). In the majority of studies, alliance portfolio’s are simply defined as “a firm’s set of direct ties” (Ozcan & Eisenhardt, 2009: 246) or “all the alliances of the focal firm” (Hoffman, 2007: 827). As such, the alliance portfolio literature basically has adopted an ego-network approach towards studying the antecedents and consequences of strategic alliance portfolios.

A central issue dominating the alliance portfolio literature revolves around how a firm can generate, configure, and develop a high performing alliance portfolio and how it contributes to firm performance (e.g. Ozcan & Eisenhardt, 2009; Lavie, 2007; Heimeriks, Klijn & Reuer, 2009; George, Zahra, Wheatley & Khan, 2001), whereby most studies explicitly address the issue of explaining economic or financial performance differences. Apart from some notable exceptions (Dyer & Nobeoka, 2000; Sarkar *et al.*, 2009), relatively little studies explicitly seek to understand the relationship between alliance portfolio composition and firm performance from an innovation or knowledge perspective. Notwithstanding the fact that alliance portfolio research is predominantly skewed towards understanding economic performance differences, knowledge governance practices and learning have nevertheless been found to maximize the returns of the portfolio of alliances (Parise & Casher, 2003; Sarkar *et al.*, 2009). This view is understandable as more and more organizations engage in interorganizational relationships with the explicit purpose of enhancing one’s knowledge base (Lichtenthaler & Lichtenthaler, 2009; Hoffmann, 2007; Inkpen, 1998). Learning therefore is inherently linked to alliance portfolio management.

Ample attention has been provided to the issue of alliance portfolio diversity and firm performance (*ibid.*), yet little attention exists for the influence of portfolio diversity on explorative and exploitative learning outcomes. More specifically, no attention exists for the interaction effects among various forms of portfolio diversity in the face of explorative and exploitative learning in an ambidextrous context. Below, this study will continue with a conceptual exploration of how these various forms of alliance portfolio diversity may affect explorative and exploitative outcomes.

## 3 Propositions

In the face of reaching a state of learning equilibrium, the diversity of an alliance portfolio is likely to play a pivotal part.<sup>1</sup> Portfolio diversity is defined as the degree of variation in alliance portfolio

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<sup>1</sup> Important to note, in this respect, is that the composition of a firm’s alliance portfolio, and specifically its state of equilibrium, is contingent on factors both external *and* internal to the focal firm. Changes in exogenous uncertainty, for instance, may cause a firm to develop its alliance portfolio more in the direction of knowledge exploration, thereby shifting this uncertain undertaking from its internal organization towards its external set of relations (Hoffmann, 2007; Brady & Davies, 2004). Likewise, the focal firm’s internal resources and strategic choices will also influence the evolution of a firm’s alliance portfolio (*ibid.*; Dittrich, Duysters & De Man, 2007). Such and other factors may cause a firm to adopt a dominant composition or design for its alliance portfolio (i.e. predominantly focused on exploration or exploitation), thus moving away from a state of learning equilibrium. For this study we choose to focus on portfolio level construct only, meaning that we will neglect environmental or

partners. Following Jiang *et al.* (2010), this degree in variation encompasses three domains. First, as a function of their differences in resources and capabilities as well as knowledge and technologies (i.e., partner diversity), second as a result of differences in functional background (i.e., functional diversity), and third as a result of differences in governance type (i.e., governance diversity) (Jiang, Tao & Santoro, 2010; Beamish & Goerzen, 2005).

We build on these three diversity domains to develop our propositions. We first establish a ground framework in which we propose that partner diversity, functional diversity, and governance diversity differentially affect, respectively, exploitative and explorative learning outcomes. Building on this framework we then present two stylized solutions – one following a parallel design, the other a ‘core-crust’ design – on how firms may configure their portfolio in order to achieve the twofold objective of optimizing exploitative and explorative learning.

### **3.1 Alliance portfolio partner diversity**

The issue of alliance portfolio partner diversity revolves around what type of partners to incorporate in the portfolio, and related to this, what type of portfolio orientation is necessary for the focal firm to achieve its (learning) goals. The composition of a focal firm’s alliance portfolio reflects the amount of horizontal differentiation, meaning the differences in unranked characteristics such as innovative orientation, functional specialization, size, *et cetera*. In other words, portfolio composition reflects portfolio heterogeneity or diversity, which is certain to affect its innovative outcomes (Luo & Deng, 2009) for an increase in network diversity implies an increase in the availability of novel knowledge accessible to the focal firm (Phelps, 2010).

When taking into consideration that innovation encompasses both explorative and exploitative outcomes, the picture becomes somewhat more nuanced. As discussed above, explorative learning is essentially different from exploitative learning. This fundamental difference must be taken into account when devising an alliance portfolio built for supporting learning processes.

The nature of explorative learning, being inherently aimed at discontinuous learning and experimentation (Simsek, 2009), implies a dependence on variation or diversity rather than uniformity. Explorative learning, thus, is expected to thrive when supported by an alliance portfolio characterized by high levels of diversity. The potential value of diversity in relation to explorative learning lies in the following. First, a focal firm with an alliance portfolio characterized by partner diversity is expected to reach more heterogeneity in its problem-solving arsenal (Simsek, 2009), for it is allowed to consider multiple perspectives in its search for a solution. In addition, this will also allow the organization to develop more advanced capabilities in dealing with a wide range of perspectives. A set of heterogeneous contacts, which are contacts holding varying social positions and characteristics, broadens the scope of knowledge available. This contrasts heavily with an alliance portfolio made up of relatively homogeneous organizations, for instance when all organizations are active in the same industry. It wouldn’t allow the focal firm to consider multiple perspectives on an issue, as alliance portfolio members are more likely to regard their environment similarly (Simsek, 2009).

Tying in to this latter notion, a focal firm’s current world view is likely to be challenged when its alliance portfolio is characterized by high levels of diversity. As such, a diverse portfolio holds more opportunities to engage into combining familiar and unfamiliar knowledge (Fleming, 2001). This is an important factor as inventions and new knowledge creation often thrive on the combination of different, disparate pieces of knowledge (Amin & Cohendet, 2004). Phrased differently, the more distant alliance partners are in terms of knowledge base, the greater the potential opportunities for engaging in explorative learning. On the contrary, the closer alliance partners are to the focal firm, i.e. the more homogenous its alliance portfolio, the more likely the focal firm is to find knowledge close to its current knowledge base. This subsequently limits its potential for explorative learning (Simsek, 2009).

Diversity, in the face of explorative learning, can stem from industrial, national, and organizational variation. An alliance portfolio characterized by industry diversity is likely to offer the focal firm a variety of resources and perspectives, thus providing superior learning and resource potential (Jiang *et al.*, 2010). An alliance portfolio characterized by national diversity, likewise, increases the potential for tapping into additional capabilities and augmenting different knowledge bases (*ibid.*; Lane, Salk & Lyles, 2001; Lubatkin, Florin & Lane, 2001). Similarly, the presence of different types of organizations in a focal firm’s alliance portfolio will provide the potential of tapping into different pools of resources and capabilities (Harrison, Hitt, Hoskisson & Ireland, 2001).

*Proposition 1a: Alliance portfolio partner diversity is positively related to explorative learning at the level of the focal firm, such that an increase in portfolio partner diversity results in higher levels of explorative learning.*

Exploitative learning fundamentally differs from explorative learning, and should be addressed accordingly. As noted above, exploitative learning is characterized by routinized, standardized learning processes, as it is aimed at refining and extending existing technologies or capabilities. This notion suggests different type of partners and subsequently a different alliance portfolio composition for successfully realizing exploitative learning.

Taking the characteristics of exploitative learning into consideration, it is important to realize that “exploiting interesting ideas often thrives on commitment more than thoughtfulness, narrowness more than breadth, cohesiveness more than openness” (March, 1996: 280), and as such require an efficient portfolio organization, characterized by centralization and tight cultures (Jansen *et al.*, 2009). A high level of alliance portfolio diversity is likely to conflict with producing an efficient portfolio aimed at exploitative learning.

The reason for this is to be found in the difficulty and complexity of governance associated with high levels of alliance portfolio diversity. Processes of exploitation are likely to be hampered by the presence of procedural differences (Simsek, 2009), and advancements taking place in the network are more difficult to monitor and manage. Also, the costs of knowledge integration are likely to rise with an increase in portfolio diversity, implying a shift away from the desired level of portfolio efficiency required for successful knowledge exploitation.

When viewing this from the perspective of industry diversity, partners from different industries are likely to hamper the manageability and efficiency needed when engaged in the process of exploitative learning, as a result of a misfit in routines and processes. Increased management complexity is also prone to occur when viewing this process from the domains of organizational and national diversity.

*Proposition 1b: Alliance portfolio partner diversity is negatively associated with exploitative learning at the level of the focal firm, such that an increase in portfolio partner diversity results in lower levels of exploitative learning.*

The negative trade-off between explorative and exploitative learning as a consequence of alliance portfolio partner diversity suggests that a balance must be achieved in terms of the degree of partner diversity characterizing an ambidextrous alliance portfolio. From the above it follows that, in essence, when an alliance portfolio is characterized by a so-called dominant design, i.e. a high or low level of diversity, mechanisms are likely to arise that deter the process of reaching a balance in exploitative and explorative learning. On the other hand, a balanced alliance portfolio aimed at reaching learning equilibrium implies that the focal firm always generates suboptimal results in terms of its explorative and exploitative outcomes. From the viewpoint of maximizing exploitative learning, the portfolio should be characterized by a homogenous configuration, while maximizing explorative learning requires a diversified portfolio configuration.

### **3.2 Alliance portfolio functional diversity**

Strategic alliances can serve a range of functional purposes (Jiang *et al.*, 2010), varying from marketing, manufacturing, R&D, *et cetera*. Essential to note, in this respect, is that particular types of functions serve exploration purposes (e.g. R&D or learning alliances, also called upstream alliances) with the aim of broadening technology or competence base, whereas other types of alliance functions serve exploitation purposes (e.g. marketing, manufacturing, and distribution alliances, also called downstream alliances), with the aim of leveraging existing resources and knowledge (*ibid.*). Past research has found that firms with different types of functional alliances (R&D, distribution, marketing) in their portfolios are more likely to hold a central position in industry networks, resulting in higher growth rates (Powell, Koput & Smith-Doerr, 1996) and higher firm level performance (Baum, Silverman, & Calabrese, 2000). The degree of diversity in terms of functional type is likely to affect explorative and exploitative outcomes at the level of the focal firm as well.

The amount of exploitative learning taking place at the focal firm level will depend on the amount or share of exploitative alliances present in the focal firm’s alliance portfolio. Likewise, the amount of explorative learning taking place at the focal firm level is dependent on the number or share of explorative alliances in the firm’s alliance portfolio. Thus, a tension arises that is inherent to an alliance portfolio: in order to raise the level of either explorative or exploitative learning, the number of either explorative or exploitative alliances needs to be increased. An increase in exploitative alliances, however, will shift the balance in learning equilibrium towards exploitative learning outcomes, while an increase in explorative alliances will shift the balance towards explorative learning.

This dynamic requires a different approach towards the concept of diversity compared to diversity as a function of partner characteristics. Whereas the underlying logic of the influence of diversity in the case of partner characteristics rests on the idea of diversity as variation, the underlying logic behind the influence of functional diversity rests on the idea of diversity as separation (Harrison & Klein, 2007). Diversity as separation defines the level of diversity as a function of juxtaposition: alliances represent opposite positions by being qualified as either downstream (exploitative) or upstream (explorative). In turn, this implies that homogeneity in alliance portfolios stems from having either many downstream alliances (as opposed to upstream alliances) or many upstream alliances (as opposed to its downstream counterpart). Maximum alliance portfolio functional diversity, thus, is attained when a balance is achieved in the share of upstream and downstream alliances present in an ambidextrous alliance portfolio, resulting in learning equilibrium as well.

*Proposition 2: Alliance portfolio functional diversity has a curvilinear association to explorative learning and exploitative learning at the level of the focal firm.*

This proposition suggests, similar to (but not the same as) the concept of partner diversity discussed above, that a hybrid alliance portfolio design results in suboptimal returns in terms of explorative or exploitative learning, while a portfolio design characterized by high levels of homogeneity (i.e., either upstream or downstream alliances) generates optimal returns on either explorative or exploitative learning, but always at the expense of one another.

### **3.3 Alliance portfolio governance diversity**

Alliances can take many forms in terms of governance, which reflect either approaches based on control or trust (De Man & Roijakkers, 2009) in order to deal with a certain degree of risk. In essence, the type of governance structure chosen for any given alliance reflects the degree of mutual trust. The higher the level of trust among alliance partners, the stronger the alliance tie relationally speaking, and the lower the need for formal control mechanisms. Conversely, the lower the level of trust among alliance partners, the weaker the alliance tie relationally speaking, the greater the perceived risk for opportunistic behavior, and the higher the need for formal control mechanisms (Jiang *et al.*, 2010). Equity-based governance structures can be regarded to reflect great need for control, while non-equity based governance structures reflect trust-based relationships. Alliance form matters when dealing with issues related to explorative and exploitative learning. Or, as Inkpen puts it, “any general theory of alliances, including one that focuses on learning, is destined to be limited in explanatory power unless the theory deals with alliance form” (2000a: 778).

The issue of alliance form in relation to explorative and exploitative learning revolves around the newness of the knowledge involved. Explorative learning is, as noted above, more experimental and non-routinized of nature, thus involving the generation and development of more innovative, new, tacit knowledge for either parties. Exploitative learning, by contrasts, is less experimental of nature, involving the extension of the current knowledge base. The level of knowledge newness is likely to be lower in this case.

As Contractor & Ra (2002) note, newer, more experimental knowledge is more likely to be tacit than codified. The less codified the type of learning involved (i.e. explorative learning), the less likely equity-based, formal governance structures are used in order to support the transfer (*ibid.*). This implies that explorative learning at the focal firm is greatest in non-equity designed alliances, built on trust rather than control in terms of governance structure (Kogut, 1988; Kogut & Zander, 1993; Shenkar & Li, 1999). The dilemma of disclosure or knowledge leakage aids the choice for a trust-based alliance form. From a portfolio perspective, this means that an alliance portfolio characterized by high numbers of non-equity, trust-based ties yields the most explorative learning. Conversely, the less new the knowledge or learning involved, the more likely the knowledge involved is codified. Codified knowledge is, by definition, more sensitive to leakage (Contractor & Ra, 2002), suggesting that alliance partners are more likely to choose alliance form based on the need for control. Formally designed alliances, characterized by high levels of control and low levels of trust, therefore can be considered to yield more exploitative learning (Kogut, 1988; Kogut & Zander, 1993; Shenkar & Li, 1999). From a portfolio perspective, this means that an alliance portfolio characterized by high numbers of equity, control-based ties yields the most exploitative learning. This implies that a combination of equity and non-equity-based alliances is required in order to reach a state of learning equilibrium.

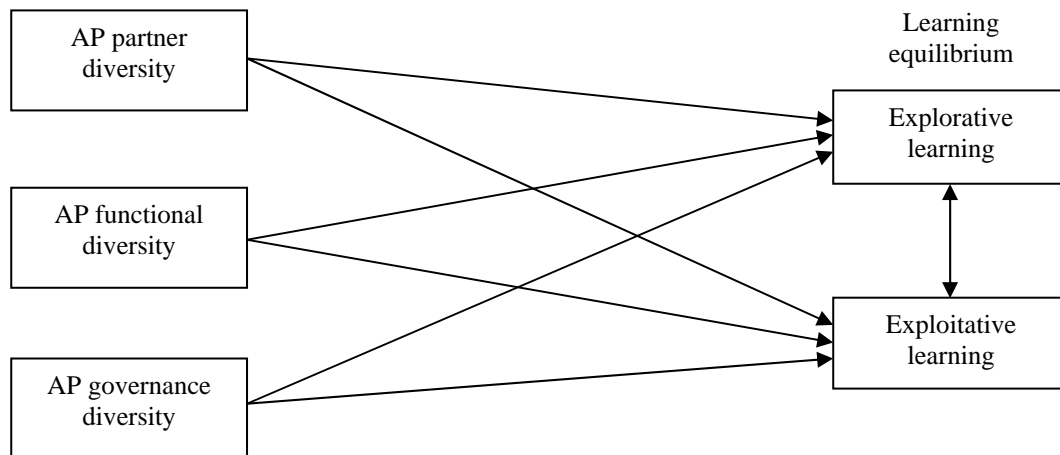
Parallel to the concept of functional alliance portfolio diversity, the underlying logic behind the influence of governance diversity rests on the idea of diversity as separation (Harrison & Klein, 2007). Again, diversity as separation defines the level of diversity as a function of juxtaposition: alliances represent opposite positions by being qualified as either equity (exploitative) or non-equity based



(explorative). In turn, this implies that homogeneity in alliance portfolios stems from having either many equity alliances (as opposed to non-equity alliances) or many non-equity alliances (as opposed to its equity counterpart). Maximum alliance portfolio governance diversity, thus, is attained when a balance is achieved in the share of equity and non-equity alliances present in an ambidextrous alliance portfolio.

*Proposition 3: Alliance portfolio functional diversity has a curvilinear association to explorative learning and exploitative learning at the level of the focal firm.*

Analogue to the concept of functional alliance portfolio diversity, a hybrid alliance portfolio design results in suboptimal returns in terms of explorative or exploitative learning, while a portfolio design characterized by high levels of homogeneity (i.e. either equity or non-equity alliances) generates optimal returns on either explorative or exploitative learning.



**Figure 1 Base-Line Conceptual Model**

**3.4 Variation across portfolio diversity domains: towards design solutions**

From the theoretical argument above it has become evident that the sources of disequilibrium in terms of knowledge exploration and exploitation are to be found across different domains of diversity. The analysis shows that there is more to the alliance portfolio than the construct initially implies. The inherently multidimensional characteristics of alliance portfolios make them interesting yet treacherous terrains to advance our understanding of exploitation/ exploration dynamics. The question of how alliance portfolio characteristics affect exploration and exploitation outcomes is inherently a multidimensional question.

The model above demonstrates the difficulty of reaching a state of equilibrium in terms of exploration and exploitation, while at the same time achieving optimal results for both learning processes. An increase in portfolio partner diversity in, for instance, the partner domain will lead to an increase in explorative learning on the one hand, but on the other hand will result in diminishing exploitative learning, resulting in a subsequent state of disequilibrium.

In addition, the conceptual model exhibits the inherent difficulty of optimizing both explorative and exploitative learning through an alliance portfolio diversity approach. Based on the analysis above, and analogue to the concept of domain separation developed by Lavie & Rosenkopf (2006), we develop two stylized solutions in order to demonstrate how suboptimal levels of exploration and/or exploitation can be addressed by varying portfolio diversity levels across domains. The concept of domain separation seeks to provide an alternative, organizational level, mode of balancing exploration and exploitation by suggesting the possibility of “exploring in one domain while simultaneously exploiting in another” (*ibid.*, 130), for instance by means of the creation of a R&D-partnership (exploration) through a recurrent alliance partner (exploitation). The two stylized solutions offered in this paper serve the purpose of advancing our thinking on alliance portfolios and exploration/exploitation outcomes (see table 1). As such, the main purpose of this approach is to generate verifiable propositions.

The first stylized solution seeks to reach optimal levels of exploration and exploitation through building an ambidextrous alliance portfolio consisting of various levels of diversity across the three diversity domains discussed above. The primary philosophy here is that optimal degrees of exploration and exploitation can never be attained by designing an alliance portfolio according to one type of

diversity only. Instead, optimal levels of exploration and exploitation can be reached by managing portfolio diversity across different domains of diversity simultaneously.

The second stylized solution offers a different approach. It explores the strategy of creating a core alliance portfolio characterized by intermediate levels of diversity in all diversity domains, thereby purposefully seeking a state of suboptimal learning equilibrium across all domains. This suboptimal, intermediate state of learning equilibrium, however, is suggested to provide the focal firm with ample opportunities to temporally shift its learning focus towards either explorative or exploitative learning. Thus, optimal levels of exploration and exploitation are attained over time. Both portfolio design solutions are further elaborated on below.

*Stylized solution 1: Reaching optimum through a parallel design*

As outlined above, optimizing explorative and exploitative learning through designing an alliance portfolio based on partner, functional, or governance diversity is destined to result in suboptimal levels for either or both exploration and exploitation. Three basic reasons lie at the heart of this portfolio management problem: 1) an alliance portfolio ideally configured for explorative learning goes at the expense of exploitative learning, 2) an alliance portfolio ideally configured for exploitative learning goes at the expense of explorative learning, and 3) an alliance portfolio characterized by an intermediate level of diversity is likely to result in suboptimal outcomes for both explorative and exploitative learning. Constructing an alliance portfolio characterized by intermediate levels of diversity, hence, cannot be considered a solution when striving for optimal results on both exploration and exploitation.

An alliance portfolio configured towards explorative learning on, for instance, the partner diversity dimension is characterized by high levels of portfolio heterogeneity (according to the notion of diversity as variation (Harrison & Klein, 2007)). This inherently leads to a negative trade-off effect, at the expense of exploitative learning, also termed a learning trap (March, 1991; 1996). Although there may be very good reasons for a focal firm to construct its core alliance portfolio such that it yields primarily explorative learning, like in the case of a biotechnology firm, neglecting exploitative learning will inevitably cause problems to occur with respect to leveraging existing knowledge (March, 1991; Lavie & Rosenkopf, 2006). The negative trade-off effect between explorative and exploitative learning as a result of building a heterogeneous core alliance portfolio in the partner diversity domain may be countered by investing in an additional alliance portfolio that functions as secondary to the core alliance portfolio, and is configured for exploitative purposes according to the functional or governance domain. As such, the negative trade-off effect is repaired by allowing a different level of diversity to occur in a different domain of diversity.

Similarly, an alliance portfolio configured towards exploitative learning on the partner diversity dimension, inherently leads to a negative trade-off effect at the expense of explorative learning, also termed a competence trap (March, 1991; 1996). Again, the negative trade-off effect caused by a dominant portfolio design in terms of partner diversity can be mitigated by configuring the alliance portfolio towards explorative learning in the functional or governance domain.

In a similar vein, optimizing explorative and exploitative learning through functional or governance diversity is likely to result in suboptimal results on exploration and exploitation at the best. Again, an alliance portfolio designed for explorative learning from a functional or governance diversity perspective isn't likely to produce significant exploitative learning, while an alliance portfolio designed for exploitative learning isn't likely to yield any significant explorative learning outcomes. In addition, and similar to the case of partner diversity, a mixed configuration for both functional and governance diversity is likely to result in suboptimal outcomes for both explorative and exploitative learning.

From a functional diversity perspective an alliance portfolio geared towards exploration is to consist of upstream alliances mainly, for explorative learning is most likely to stem from alliances aimed at generating or developing new knowledge and capabilities. A focal firm's core alliance portfolio built around upstream alliances primarily, is likely to result in diminishing levels of exploitative learning. Likewise, an alliance portfolio geared towards exploitation is to consist of downstream alliances mostly, inevitably resulting in diminishing degrees of explorative outcomes. A heterogeneous portfolio in terms of functional alliances is likely to result in suboptimal performance for both explorative and exploitative learning.

A negative trade-off effect as a result of creating a core alliance portfolio geared towards exploration in the functional domain, can be mitigated by adopting diversity levels in the partner or governance domain level appropriate for exploitation. For instance, the trade-off effects of an alliance portfolio consisting of primarily upstream alliances can be mitigated by homogeneity in the partner domain. And, *vice versa*, the partner and governance dimension can be applied to mitigate negative

trade-off effects at the expense of explorative learning as a consequence of configuring the alliance portfolio towards exploitative learning from a functional perspective.

From a governance perspective, trust-based, non-equity alliances are more likely to generate explorative learning, while control-based, equity alliances yield higher levels of exploitation levels. Following the logic of diversity as separation (Harrison & Klein, 2007), alliance portfolio governance diversity is expected to produce maximum results in terms of either explorative or exploitative learning when following a dominant design logic (i.e. homogeneity). Again, a focal firm is expected to see little explorative learning to occur when its alliance portfolio consists of downstream alliances mainly, while an alliance portfolio design consisting of upstream alliances primarily will go at the expense of exploitative learning. Like in the case of functional diversity, an intermediate level of diversity is expected to yield suboptimal returns in terms of both explorative and exploitative learning.

Following its functional counterpart, a negative trade-off effect as a result of creating a core alliance portfolio geared towards exploration in the governance domain theoretically can be mitigated by adopting appropriate diversity levels in the partner or functional domain level. For instance, the trade-off effects of an alliance portfolio consisting of primarily non-equity based alliances can be mitigated by homogeneity in the partner or functional domain. In all, this suggests the following:

*Proposition 4: Optimal levels of both exploration and exploitation can be attained by varying levels of diversity across domains, such that an alliance portfolio geared towards exploration (exploitation) in one domain is matched by a portfolio design geared towards exploitation (exploration) in another domain.*

Constructing an alliance portfolio with varying degrees of diversity across domains in an ambidextrous manner does require the focal firm to actively steer and manage different degrees of diversity simultaneously. This has two major disadvantages. First, given that modern enterprises tend to maintain dozens of alliances in their portfolio at any given time, the effort of managing three dimensions of this alliance portfolio in an integral manner becomes an extremely complex and challenging commitment. Second, alliance portfolios are not only hard to monitor and manage (Parise & Casher, 2003), but also difficult to change in terms of strategic or learning intent (Koza & Lewin, 1998). It will prove highly complex, but above all, time consuming to alter each of the three domains of diversity such that it corresponds better to changing market conditions. In light of this complexity, we forward stylized solution 2 below.

*Stylized solution 2: Reaching optimum through a 'core-crust' design*

Recognizing the difficulty of changing the dynamic of an ambidextrously designed alliance portfolio harvesting varying levels of diversity across domains, solution 2 suggests a different approach. As we will outline below, this solution allows the focal firm to respond to changing market conditions, with corresponding alterations in exploitation or exploration demands, more swiftly.

In essence, this solution departs from the notion that an alliance portfolio characterized by suboptimal levels of exploitation and exploration as a result of intermediate levels of diversity across all three domains, offers the focal firm the opportunity to temporally shift its focus towards either exploration or exploitation in order to optimize of either type of learning when the circumstances require a focal firm to do so. Thus, this solution suggests a focal firm to build a core alliance portfolio designed to attain intermediate levels of explorative and exploitative learning, and to optimize one of both by temporally constructing an additional portfolio aimed at either exploitation or exploration. The focus, hence, lies in purposefully seeking *temporal learning disequilibrium* in order to reach optimal results.

Consider the example of a pharmaceutical firm. To successfully develop (i.e., explore) and commercialize (i.e., exploit) a medicine, pharmaceutical firms depend on their alliance portfolio, as it is too costly and risky for them to market new medicines completely autonomously. Initially, a firm may decide to design its alliance portfolio such that it sub optimizes exploitative and explorative learning through moderate levels of partner, functional, and governance diversity. However, during the research and development stage of a new medicine this firm may decide to temporarily augment its portfolio diversity, to the end of explorative learning, by engaging in new alliances with different partners, upstream functionality and equity-based. Once the medicine is fully developed and tested, it needs to be brought to the market. To this end, the firm may dissolve its R&D-oriented alliances and replace them by ones that enable it to realize exploitative outcomes. That is, it may establish alliances with more homogeneous partners possessing downstream functionality, and preferably organize them through non-equity arrangements. Taken together, the focal firm in this example shifts its focus on exploration and exploitation through time, while its core alliance portfolio remains intact.

This solution carries a number of advantages in comparison to solution 1. Most notably, the level of complexity in terms of managing the core portfolio decreases, as all domains of portfolio are characterized by intermediate levels of diversity. But more importantly, this solution allows a company to dedicate its attention to a core portfolio for most of the time, allowing the alliance portfolio to reach more or less stable and predictable learning outcomes. The possibility of maximizing explorative or exploitative learning through a secondary, temporal portfolio does not affect the core all too significantly.

*Proposition 5: Purposefully departing from a suboptimal state of exploration and exploitation through intermediate levels of diversity across all diversity domains, allows the focal firm to temporally change its alliance portfolio design in favor of either exploitation or exploration when changing market conditions demand for optimizing one of both learning processes.*

**Table 1 Two Alliance Portfolio Solutions**

	<b>Parallel equilibrium</b>	<b>Core-crust model of equilibrium</b>
Description	Exploitative and explorative learning are realized through balancing domain diversity in alliance portfolio design	Exploitative and explorative learning are realized through temporarily augmenting a core alliance portfolio design
Theoretical rationale	Optimal degrees of exploration and exploitation can never be attained by designing an alliance portfolio according to one type of diversity only. Optimal levels of exploration and exploitation can be reached by managing portfolio diversity across different domains of diversity simultaneously	Optimal degrees of exploration and exploitation can never be attained by designing an alliance portfolio according to aligning three types of diversity. Optimal levels of exploration and exploitation can be reached by managing portfolio diversity across time
Benefits	<ul style="list-style-type: none"> <li>- Sustained exploitative and explorative learning</li> <li>- More dedicated alliances in portfolio; less opportunistic behavior</li> </ul>	<ul style="list-style-type: none"> <li>- Flexibility realizing exploitative and explorative learning</li> <li>Nucleus of dedicated alliance partners; inter-partner learning</li> </ul>
Risks	<ul style="list-style-type: none"> <li>- Risk of temporary learning and/or competence traps</li> <li>- Highly dependent of changing market conditions</li> </ul>	<ul style="list-style-type: none"> <li>- Temporal changes to portfolio increases risk of opportunistic behavior</li> </ul>
Illustration	Pharmaceutical firm fundamentally adjusts alliance portfolio design to reach optimal levels of exploration and exploitation at all times	Pharmaceutical firm temporarily adjusts alliance portfolio design to match with requirements of distinct product development stages

#### 4 Discussion and Conclusion

This paper set out to conceptually explore under what conditions of alliance portfolio diversity a desired state of learning equilibrium could be attained, such that both explorative and exploitative learning are optimally produced. In part, the theoretical exploration revealed a complex, multidimensional role for the concept of portfolio diversity in the advancement of both explorative and exploitative learning. In essence, diversity affects explorative and exploitative learning differently, suggesting that an increase in diversity positively effects explorative learning at the expense of exploitative learning in the partner domain. Conversely, a decrease in partner diversity positively effects exploitative learning at the expense of explorative learning. Propositions 1a-b address this notion. In the case of both functional and governance diversity, intermediate levels of diversity are expected to yield suboptimal returns for both explorative and exploitative learning, while a homogenous diversity design yields either explorative or exploitative learning. Propositions 2 and 3 articulate this notion by stating a curvilinear association. It implies that a focal firm’s top management is to carefully and consciously monitor and regulate their alliance portfolio design. How exactly remains unclear in extant literature. This paper makes a first stylized effort in order to fill this lacuna.

To overcome this problem of design, which in our view is inherent to ambidextrously designed alliance portfolios especially, the focal firm faces the challenge of managing portfolio diversity analogue to the concept of domain separation (Lavie & Rosenkopf, 2006). It requires management to regard a

focal firm's alliance portfolio as a multidimensional phenomenon, especially when viewed from a diversity perspective.

This perspective offers a focal firm's management to align its alliance portfolio in the face of learning equilibrium, by managing diversity across different domains. Distinguishing three forms of diversity – namely partner, functional, and governance diversity – this perspective allows a focal firm to design an alliance portfolio with differential diversity characteristics. By means of stylized solution 1 'parallel design', it is proposed that high(er) levels of diversity in one domain, for example the partner domain, may be compensated by low(er) levels of diversity in another domain, for example the functional domain. This allows the focal firm to meet the design demands in terms of portfolio diversity, when engaged in reaching desired states of explorative and exploitative learning outcomes. Proposition 4 addresses this specific issue.

Stylized solution 2 'core-crust design' further explores the domain separation concept. Instead of approaching the challenge of reaching an optimal learning equilibrium from an ambidextrous perspective, however, this solution seeks to reach such a desired state of learning over time. It suggests a focal firm to purposefully build a core alliance portfolio characterized by intermediate levels of diversity across all domains, thus accepting a permanent state of suboptimal exploration and exploitation. Subsequently, a focal firm is advised to seek optimal levels of either exploration or exploitation by building a second, temporal portfolio geared exclusively to either type of learning. Proposition 5 articulates this position.

Besides advancing our theoretical understanding of alliance portfolio dynamics, this paper can also be interpreted as an endeavor to forward our understanding of exploration/ exploitation-dynamics. Whereas initially both types of learning were regarded as fundamentally incompatible (March, 1996), the concept of domain separation appears to allow for a successful combination of explorative and exploitative enterprises in the context of an ambidextrously designed alliance portfolio.

This paper, thus, provides an original contribution in two distinct ways: first, it forwards the idea of various forms of alliance partner diversity (Jiang *et al.*, 2010) in relation to the concept of learning equilibrium. Second, it expands on the idea of domain separation (Lavie & Rosenkopf, 2006), which was originally conceived in the context of dyadic alliances, translating it to the domain of alliance portfolios. The two stylized solutions discussed above materialize this contribution.

The analysis in this paper limits itself in a number of ways. The focus is on the effect of 1) diversity on 2) ambidextrously designed alliance portfolios, in the face of 3) exploitation/ exploration equilibrium. Alliance portfolio structure is left out of the equation, as is a whole range of potential factors exogenous to the alliance portfolio or focal firm. In addition, factors internal to the focal firm are not taken into account. Finally, it is of a purely conceptual nature. Future research may test the propositions first by means of a longitudinal case study to obtain in-depth insight in alliance portfolio development (i.e., core-crust dynamics). Subsequently, a survey would enrich our understanding by providing generalizations.

To conclude, we engaged with the recent turn in alliance studies to adopt a portfolio approach. Specifically, we advanced prior literature on alliance portfolios and exploitative and explorative learning by proposing how the composition of a focal firm's alliance portfolio in terms of diversity affects its exploitation/ exploration equilibrium. Our analysis suggests that alliance portfolio diversity results in different outcomes for both explorative and exploitative learning, making it difficult to establish the optimal degree of diversity. Analogue to the concept of domain separation, we forward the idea of establishing different degrees of diversity across various domains enabling firms to adopt two solutions: parallel design focusing on parallel logic and core-crust design focusing on temporal separation.

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## Identifying Universities' Value Potential for Entrepreneurial Ventures\*

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**Abstract:** The paper presents a joint research project of the Universities of Dortmund, Frankfurt and Magdeburg called Uni:prise – Universities as Enterprises. It deals with the identification of universities' value-creating potentials, and it investigates future issues of the university system, in particular the institutions and actors involved in developing research and higher-education capacities in the course of an entrepreneurial process. In detail the project concentrates on the following key questions: What are the underlying innovation and investment processes in science? What are the goals and means, costs and benefits of science for researchers, students, and the economy? How can improvements in the field of opportunity research be identified and designed for use? What kind of opportunities can be recognized for advanced academic autonomy by using performance related distribution systems? And finally efforts are made to create business models for the core potentials of the entrepreneurial university in research, teaching and technology transfer.

**Key words:** Value-creating potential; Entrepreneurial opportunities; Business model

### 1 Introduction

The research is based on theoretical as well as on empirical economic and social science approaches and methods. The project design aims in addressing three levels of investigation, divided into three phases. The first phase includes the model level, institution level and player level. The second phase contains the evaluation of the empirical and theoretical research concerning every level. The third phase covers the documentation of the results of all three levels followed by feedback towards universities in the interaction. Finally the relations between the addressed research questions and the employed research methods are discussed. Historically seen this specific discussion is rather young and started at the beginning of the new millennium when regarding the development and arrangement of the knowledge society which increasingly focused on economic utilization of scientific knowledge. In the course of that a central importance is assigned to the universities as engines of the development of innovations. International discussion of universities as potential cores of added value chains, i.e. from the finding of ideas to the utilization of innovative potentials, therefore has increasingly taken into account knowledge and technology transfer as means to the creation of value generating processes. While the institutional research (university research) has paid attention especially to the system analysis of a reform-driven construct named "Higher Education" since the 70s of the 20th century, in the course of the 90s a different concept, coming from business administration and called „New Public Management“, had been applied to the question of how to make universities more effective as well as efficient in research, teaching and administration. This development has also been described as a disciplinary shift from sociology to economics. Now the purpose was to implement efficiency-rising attempts in research, teaching and (self) management of universities, like expense account and achievement calculation, purpose arrangements, identification number development, incentive systems, optimization in the use of resources, and to introduce and internally launch new governance structures.

All these considerations have in common that they pursue an increase of institutional autonomy of universities which enables them to improve the quality of research and teaching constantly even while they have to deal with quickly changing conditions, such as degressive developments concerning the universities global budgets. At the same time the impact of third means income should rise for the fulfilment of excellency criteria as well as in order to increase the power to compete in a developing international university market. In this context a socio-political desideratum arises for the management

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of a university: to make the results of excellent research and education quality increasingly available to the local economy. A necessary condition for initiating this process successfully lies in the arrangement of a knowledge transfer, a task which rises, in addition, in complexity because the research and development process on the part of the universities should be done starting from basic research up to final application, e.g. by trading partners.

## 2 The Creation of Value-Added Support

The creation of the added value chain in the transfer process on the part of the economically-cooperating university goes along with new challenges. A transformation process linked with it should lead to an Entrepreneurial University which finances itself no more exclusively from tax means, but also as a market participant equipped with the competence to produce innovative spin offs. With this aim accomplished the university would be even in the role of a public-private entrepreneur. Originally being an institution of public right in Germany, exclusively paid from tax means, a university may widen into to a market participant with the developing competence for innovative Spin outs, possibly in the form of a public-private think tank.

The first steps at an early stage of development into such a direction are recognizable in Germany in particular in those universities which have marked their profile significantly as "entrepreneurial universities". As a prominent example one can point out the University of Technology of Munich (TUM) one of the first three universities taken up within the scope of the excellency initiative in the conveyor line "Zukunftskonzept" (plan for the future), which wants to realize the conjunction of research excellency and entrepreneurship. For a science economy which wants to take relation on such transformation scenarios the first step would be doing research by creating a suitable model. Central questions to be discussed would have the following focus:

a. An economically relevant question in general is targeting the role as well as the function of universities as public and publicly funded institutions. Public funding is considered to be essential because of the necessity to make publicly available offers for higher education linked with the question, whether the state as a supplier takes the role of a social entrepreneur. Taking in account the acceptance that a degressively running public financing of the educational sector can not be substituted completely the question has to be answered by science-economic research exactly what kind of value generating structures can be found to bring up a transfer-supported, scientific utilization combined with (re)financing options in addition (Weisbrod 1998). Besides, special attention should be paid to the analysis of economical potential of usable knowledge basins which integrate applicable research (patenting/licensing, spin-offs/start-ups, public-private-partnerships, order research, extended workbenches, intrapreneurship, profit centres), as well as special formats of teaching in higher education (work accompanying continuing education, coaching, studies on private costs, international management, lifelong learning, train-the-trainer-concepts). For the invention, development and utilization of these potentials a transfer draft at microtheoretical level is to be developed which is compatible with given structures and offers incentives to motivate actors within and outside universities to participate.

b. In a parallel investigation it has to be discussed under inclusion of the effect of market failure to what extent resources can not be made available by the market efficiently. If a market failure is recognizable under this condition, state interventions are judged as being necessary. For instance, it is assumed that universities make new knowledge, as well as new technologies available as public goods characterized by a non-exclusivity concerning their utilization. Announcing the research results by publication or market launch means an advantage also to those economic subjects who are not included into the prize and profit system of the utilization. Given research and development are financed privately, these so-called spillover effects led to a lower investment in Research&Development (Arrow 1962). This indicates that in the analysis of university and market the classical causes for market failure in the neoclassical model (public goods, asymmetric information, external effects, monopolies / cartels) have to be discussed anew. Therefore it is important firstly to check the relevance of reasons for single market failure in the context of modern universities. Afterwards the present state financing policy should be analyzed concerning its propriety and, in a second step, attempts to create an optimization are brought to discussion.

c. To make universities capable of entrepreneurial acting and awake their sensibility for the importance of creating incentives for co-operations with actors from in and outside the institution, both described research ropes should be flanked by economic research on business models. These ropes will

be used later on to recognize added value potentials from research and teaching and to prepare as well as to transform them for getting them into the market (Osterwalder, Pigneur 2009). The special challenge consists in developing commercial model constructions in particular for knowledge-based projects so that they have a potentially high transference value. With the help of the central commercial model components like use promise (which use is donated for customers and enterprises?), added value generation (how there originates a demanded achievement?) and profit model (by which and how money is earned?) commercial model types should be identified that show a very extensive basis of common characteristics, so that the part which must be worked out for each individual business differs minimally. For knowledge-based commercial models for projects with an expectable high degree of innovation, the analysis options leading to high growth effects is, in addition, especially interesting.

d. The universities meet these challenges in an institutional way: On the one hand organizational processes are optimized by a steadily improved management, on the other hand, the problems are answered by growth of institutionalizing processes. This leads to more and more service centers often characterized rightly as „island solutions“ in the overall university because of their incomplete interlinking within their university and their personnel's sole occupation with "third sphere professionals". Examples are computer centers, libraries, transfer agencies, places of the scientific continuing education, university didactics, multimedia information centers, career services, Alumni organizations or "houses of competences" in which general and special skills are tied together to new qualification profiles. Up to now attempts for a systematic integration led to more institutional answers, as for example the establishment of more functional jobs as support to already existing leading positions. Left out of consideration are the exchange processes necessary between the departments as well as systematic requirements of the universities and their executive management. At this institution level (Mesolevel) it requires suitable business models to make services transparent, countable, billable and steerable in a targeted manner, so that they are placed in the position to act autonomously and strategically effective.

e. The research perspective would remain limited and hardly connectable with the model level, if identified actors (key players on the microlevel) would not be included into the examination of the processes on the institutional level. The methodological framework of empirical social research should be employed in both, qualitative and quantitative studies in order to be able to identify the strengths and weaknesses as well as opportunities and threats actors in their institutions can recognize (SWOT analysis). The perspectives of this investigation will be directed mainly on business-related issues looking for entrepreneurial attitudes of the interviewees while looking for potential in research and development.

f. Actors at universities such as scientists and managers consider entrepreneurship to be risky. This is an important reason for entrepreneurial opportunities not to be realized. This phenomenon has both, rational and irrational components. In economic science the subject is highly relevant because it has a significant impact on the entrepreneurial involvement of actors in and outside of science. Using methods from the still young discipline of Neuroeconomics a framework for special research studies has recently been developed in laboratory tests in order to analyse the rationalization of irrational and emotional aversions. These tests hopefully will deliver the basis for engineering a training for recognition of entrepreneurial opportunities. The actors on the microlevel identified earlier who have been classified by their universities' facilities and services under a business perspective during their interviews before, now are ready to run through a selection of the mentioned examination settings. The results are finally supporting the reflection on how the actor's behaviour and preferences are influencing a university's business model.

### **3 Project Design, Key Questions and Interdisciplinary State of Research**

The research on the model as the macro level, framing the whole topic while asking for „Universities as Social Enterprises“, is based on the initial condition of a determining market failure theory, coupled with reflections on „Social Entrepreneurship“. The question how a university is conceivable as a social enterprise relates to the little explored area of business model research in this context.

On the side of empirical research, especially on the level of control processes in universities (meso level), management changes and the introduction of innovations in higher education are focused.

The project level to identify and interview university actors as key players in the process of institutionalization, using qualitative and quantitative social research methods (micro level) is connected

with the issue of knowledge management and self management in the context of teaching and learning processes at universities. What is new is the inclusion of neuro-economical research approaches in the consideration of attraction and aversion when dealing with the implementation of innovations in the university system.

This empirical economic research, in close cooperation with the neurosciences, promotes the topic of incentive structures and how they can promote risk-bearing entrepreneurial action. With regard to the implementation of intrinsically motivated initiatives and the assumption of responsibility as a fact in the change of management processes institutional conditions are influencing what actually happens in terms of quality and modernization (such as job security and limits in personal advancement development). Therefore the interdependence between the anticipatory actor and the changing institution plays a significant role. To put the point as a question: How much entrepreneurial spirit allows an institution and by whom can an institution be developed which does neither create nor offer incentives for their actors?

The starting position in the international research reveals desiderata for the discussion of the future importance as well as the embedded meaning concerning how research, teaching and development will look like in a globalized world which depends more than ever on courageous and energetic entrepreneurial universities. The topics merged and scientific disciplines put to use in this investigation, however, especially focus on the importance of business models for knowledge-based institutions. The architecture developed for this research project can be tracked by the clarification of certain key concepts and their characterization in international research. It is important to start with a central prerequisite for studying the „Entrepreneurial University“ which is due to the Theory of Market Failure and its possible implications for economic policy (Fritsch et al. 2007). It is important that the discussion is redirected to potential reasons for market failure, pointing out the importance of external effects (Maskin 1994). Institutions of the state, such as universities, have been understood as transmitters of externalities already in the mid 70ies of the nineteenth century (McKean 1975). Nevertheless, the paradigm for growth processes remained to be the private sector. Can incentives as they arise e.g. by external effects be transmitted to the public sector too? If so it would make sense to analyse research on a private sector and its effects on endogenous growth (Corriveau 1998). A related question is, what effects subsidization of education with public funds has on competition among students, teachers and institutions. On the one hand people are provided for with public money who in turn make their gains in education available for the private sector. On the other hand public educational institutions are subsidized although they are primarily oriented towards institutional parameters targeting institutional growth in first instance. This discussion is part of a discussion on approaches to a reform of higher education subsidies (Barbaro 2003). How far public institutions like universities are meant to take over the role of an initiator of supporting science based entrepreneurial start-ups already leads the discussion into the field of possible interaction between science and economy and their respective interfaces between their primary interests and markets (Mayer-Krahmer, Kulicke 2002). However, it turns out that institutions instead of relying on entrepreneurial activities rather tend to take money on fees as the example of tuition fees demonstrates. Finally the normative question has to be answered how much of a market in higher education is appropriate and how much tuition appears to be justifiable (Schmidtchen 2005). This goes back to the question just what kind of an entrepreneur a public university should be allowed to be? This question of appropriateness is discussed from an entrepreneurial point of view (Bok 2003) as well as from standpoints of legal science and sociology (Weingart 2008). At this point – right before the beginning of the last decade – more and more the idea of a university as a social entrepreneur comes into play, starting with a general discussion on universities as social entrepreneurs but already stressing the aspects of commercialization of education and research (Powell, Owen-Smith 1998), while in the USA researchers already had started to analyze the competitive edge of universities for some time in research based on their strengths and weaknesses in comparison with industrial suppliers (Rosenberg, Nelson 1994). In order to make education and R&D attractive for more private companies the idea emerged to transmit single elements of the idea of social entrepreneurship to private companies by highlighting their corporate social responsibility (Kotler, Lee 2005).

#### Conclusions and Recommendations

All these approaches towards entrepreneurial universities, though, are fundamentally dependent on the development, design and implementation of business models raising economic growth. This marks a major research desideratum which, at the same time, is one of the most important challenges in economy of science and all cooperating academic disciplines (Gaus, Raith 2012). The term “business model” has become popular during the Dot-Com Boom in the late nineties. Since then the academic literature

dealing with the issue is currently still inconsistent and fragmented. After the definition of the concept and its inherited elements had been discussed first (Osterwalder et al. 2005; Pateli, Giaglis 2004) different perspectives were established. The survey and mapping of internal processes resulted in enterprise models useful for applications in existing companies. The view towards surroundings and network of a company allows, however, to create business models for the analysis and synthesis of start-up projects. Although there is no universally accepted definition for the term „business model“, the general expectation is, that a business model is something any entrepreneur would profit from. The benefits of “business model” as a concept has been discussed controversially (Porter 2001, Magretta 2002). Hence, the amount of publications in this field is growing rapidly (Morris et al. 2005, George&Bock 2010). Concerning the perspective of research in entrepreneurship the practical application of health-business models and the subsequent adaptation to changing environmental conditions are of interest (Amit, Zott, 2001; Guenzel, Wilker 2010). The business model, at this point, is understood as a means for entrepreneurs to present all elements of their business in parallel as well as in their relations and to enable them to alter the presentation easily and quickly to find out most about best solutions.

Finally it is highly interesting so see how sociology refers to this topic from a perspective in Higher Education and Institutional Research. In sociological literature universities are understood as systemic knowledge networks which initiate continuing processes. These are influenced by individual and by institutional actors (Bender 2001). Not the temporarily existent network of different actors is supposed to be the contextual precondition for the creation of new scientific knowledge in first instance, but the institutional form in which it is performed (Callon et al. 1986). For the organization of research and teaching in faculties and departments this is associated with „Multi-divisionären Unternehmensformen“ (North 2002). This means that institutions, including universities, are able to generate value in going through these processes.

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# Direct and Indirect Ties to Universities: Firm Heterogeneity, R&D Collaboration and Innovative Performance in the Biopharmaceutical Industry

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**Abstract:** In knowledge intensive industries, firms often conduct collaborative research both with universities and with other firms, but the implications of such simultaneous engagement in R&D collaboration with different types of partners has not received due attention. We examine whether there are potential complementarities or incongruities related to simultaneous engagement in multiple types of research collaborations, and potential heterogeneity among firms in the benefits of collaboration. Drawing on panel data for 40 major pharmaceutical firms, we find that positive effects of direct university collaboration are restricted to firms with sufficient absorptive capacity to assimilate scientific knowledge. Firms lacking such capacity instead benefit from 'indirect' ties with universities (collaboration with university-centred dedicated biotech firms) while direct university collaboration only undermines the benefits of their inter-firm research alliances.

**Key words:** R&D collaboration; Alliances portfolios; Industry-science linkages

## 1 Introduction

Knowledge-intensive industries and science-based industries in particular, have been characterized by an intensification of the interactions between universities and firms (e.g. Hall et al., 2000; Cassiman et al., 2008). Firms increasingly look towards public science as one of the key sources for rapid and privileged access to new knowledge (Cockburn and Henderson, 2000; Zucker, et al., 1998; Mowery, 1998; Bruneel et al., 2010). This puts the need for external knowledge sourcing from universities high on the corporate agenda in order to keep at the forefront of the ongoing creation of new, state-of-the-art knowledge (Cohen et al., 2002; Mowery and Nelson, 1999; Balconi and Laboranti, 2006). Prior research on industry-science linkages has shown that research collaboration with university scientists is an important means for effective scientific knowledge sourcing and that this may yield a positive effect on a firm's innovative performance (Zucker and Darby, 2001; Zucker, et al., 2002; George et al, 2002; Cassiman et al., 2008). More specifically, such business-university R&D collaboration may enhance firms' capacity to generate high impact technologies and introduce new products to the market (Belderbos et al, 2004b; Faems et al., 2005; Cassiman et al. 2008).

In the literature, there are two different, seemingly conflicting views on firm - university collaboration. In the industry-science literature on the one hand, the importance is stressed of *direct* collaboration with universities, which is especially useful in knowledge-intensive industries (see Cohen et al., 2002). The idea is that in these industries it is important for firms to collaborate directly with universities in order to source state-of-the-art expertise as developed at public research organizations and universities (Zucker and Darby, 2001; Zucker et al., 2002; 2002; Cassiman et al., 2008). It has been demonstrated that direct collaboration with universities appears to be the realm of firms with substantial internal R&D capabilities (Belderbos et al, 2004b; Nakamura et al., 2003) and it has been suggested that active involvement in scientific research and in research collaboration is highly conditional on the availability of human capital and the adoption of specialised organizational practices and routines in R&D (Gambardella, 1992; Cockburn et al, 1999). On the other hand, studies in the innovation and strategic collaboration literature have demonstrated that even in the pharmaceutical biotechnology industry, the most science-based of all industries (e.g. Cohen et al., 2002), large pharmaceutical companies do not necessarily engage in frequent research collaborations with universities. Instead, the practice of collaboration with entrepreneurial dedicated biotech firms (DBFs) that are themselves strongly linked to universities and embedded in academic networks, is more common (Powell et al., 1996; Pisano, 1991; George et al., 2002; Stuart et al., 2007).

A first objective of this paper is to consider the potential differential performance implications of direct collaboration when compared to indirect, 'brokered' ties to academia. We distinguish three types

of collaborations: direct collaborative research with universities, direct research alliances with firms, and 'indirect' ties to universities through research collaboration with dedicated biotechnology firms (DBFs) that do have strong research ties with universities. The latter may serve as a conduit for the transfer of relevant scientific knowledge to firms lacking effective capabilities to be involved in direct research collaboration with universities. Our analysis focuses on this role of firm heterogeneity in the effectiveness of different types of research collaboration (D'Este, 2005; Cassiman et al., 2008). Specifically, we examine the moderating role of firms' absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002) for scientific knowledge as indicated by the intensity of involvement by the firms' R&D personnel in publication efforts. Our aim is to shed some more light on the heterogeneity in industry - science collaboration and on why some types of linkages may be more attractive than others (George et al., 2002).

Apart from collaboration with universities, collaboration with other companies has been demonstrated to be particularly useful for firms in knowledge-intensive industries (e.g. Hagedoorn, 2002; Powell et al. 1996). A broad literature on inter-firm alliances has demonstrated that a firm's direct ties, indirect ties, and its network position (i.e. centrality) may contribute to its innovative performance (e.g. Ahuja, 2000; Gilsing et al., 2008). More recent work has taken a portfolio perspective on technology alliances (Rothaermel and Deeds, 2004; Ahuja 2000; Lavie, 2007; Sampson, 2007; Goertzen, 2007). A portfolio perspective points to the aggregate properties (i.e. synergies and liabilities) of a set of alliances that may affect innovative performance, which is likely to remain unnoticed when focusing on individual alliances only (Wassmer and Dussauge, 2011). One such aggregate property is formed by diversity of partners in a portfolio, which is generally considered to be positive for a firm's innovative performance due to its potential for recombination (George et al., 2001; Laursen and Salter, 2006; Phelps, 2010). However, this literature has focused primarily on inter-firm alliances and has not examined how portfolio effects are influenced when universities are also considered as collaboration partners.

Hence, the second objective of this paper is to examine whether there are potential complementarities or incongruities related to simultaneous engagement in collaboration with multiple partner types, and in how far this may differ across firms. As the logic of scientific discovery differs profoundly from the logic that characterizes the development of new technologies and their practical applications (Hall et al., 2000; Nelson, 2004), a combination of collaboration with both firms and universities may lead to a degree of diversity that it is difficult to manage effectively. Our key argument is that direct collaboration with universities and with firms may be less compatible as they require different collaborative routines and research practices, while indirect collaboration and inter-firm alliances may be more likely to complement each other in the pursuit of positive innovation outcomes. Moreover, we argue that differences in firms' absorptive capacity and R&D strategy lead to differences in how far they will benefit from direct or indirect collaboration with academia and from a combination of inter-firm and direct university-firm collaboration. This heterogeneity has been a largely ignored issue in the literature on university-firm collaboration thus far (George et al., 2001; 2002; Cassiman et al., 2008).

We empirically investigate these questions using panel data describing the innovative performance (as measured by citation weighted patent counts), R&D collaboration strategies, and scientific publication efforts of 40 large biopharmaceutical firms with home base in the US, Europe and Japan during 1995-2002.

## 2 Theoretical Background

### *Direct collaboration between firms and universities*

In the life sciences and the biopharmaceutical industry, public science forms one of the key sources for rapid and privileged access to new, state-of-the-art knowledge (Cockburn and Henderson, 2000; Zucker, et al., 1998; Mowery, 1998). In general, direct collaboration with universities tends to be in more uncertain areas and further away from commercialization. Although new scientific knowledge gets disseminated through publications, an important part of it tends to be non-codified and can only be exchanged through close interaction between individuals, through teams of university and firm scientists (Zucker et al., 1998; 2002; Cassiman et al., 2008). This tacit and sticky nature of scientific knowledge induces a necessity for firms to create direct links to the scientific community. The creation of direct ties allows for the build-up of trust (Gulati, 1995a), forming an important prerequisite for the efficient exchange of tacit knowledge. Direct collaboration also reduces the likelihood of noisiness in information

exchange and of fine-grained specificities getting lost, which mitigates the risk of misunderstanding on the side of firms (Ahuja, 2000). Furthermore, the importance has been demonstrated of direct involvement of corporate researchers in scientific research and academic networks in their function of 'boundary spanners' or 'gatekeepers' (Tushman, 1977; Zucker et al., 1998; 2002; Zucker and Darby, 2001; Löfsten and Lindelöf, 2002; Carayol, 2003; Baba et al., 2009). This role may provide firms with a timing advantage regarding the moment that they learn about new scientific findings (Fabrizio, 2009). Taken together, direct collaboration may enable firms to better decode advances in fundamental research and evaluate its quality and usefulness. In this way, direct collaboration may support a firm in pursuing in-house basic R&D and contribute to increasing its R&D productivity (Gambardella, 1992; Cockburn and Henderson, 2000; Zucker and Darby 2001; Zucker et al., 2002; Fleming and Sorenson, 2004).

The benefits of direct collaboration with universities notwithstanding, they come at a price as there are also various kinds of barriers to knowledge exchange with them (Hall et al., 2001; Bruneel et al., 2010). First, there can be a large cognitive distance between universities and firms (Nooteboom et al., 2007). Scientists' focus on understanding fundamental problems and industrial researchers' focus on application-related issues yields a large cognitive distance between the two. As a consequence, these differences in cognition may create a risk that both parties do not sufficiently understand each other, with firms asking the 'wrong' knowledge questions and not being able to understand the answers they get, whereas scientists may misinterpret the questions or be unable to come up with an unequivocal answer (Gittelman and Kogut, 2003). Second, the institutional logic of scientific discovery is an entirely different one than the institutional logic that characterizes industrial development of new technologies and their practical applications. Science forms a separate 'epistemic community' with its own practices and routines that conflict with the routines and practices in firms that are specifically geared towards the upscaling and commercialization of (scientific) inventions (Allen, 1977; Tushman, 1997). Scientists tend to focus on research that is considered to be interesting and valuable by the scientific community, whereas firms' researchers will make choices based on what is considered to be useful for the creation of new products, processes and/or services (Gittelman and Kogut, 2003; Nelson, 2004). Furthermore, university scientists will be keen on disclosing quickly, in order to gain academic recognition and prestige, whereas industrial researchers may wish to keep information secret to facilitate value appropriation. Hence, institutional norms governing knowledge creation at universities differ profoundly when compared with firms (Dasgupta and David, 1994), and even with the assignment of 'gatekeepers' a large cognitive and institutional distance is likely to remain (Gittelman and Kogut, 2003). Altogether these barriers, combined with the insecure benefits, may mitigate the positive effect of direct collaboration with universities on a firm's innovative performance.

#### *Indirect ties between firms and universities*

Indirect ties imply that a firm is indirectly connected to a university through a common partner (Gulati, 1995b). Following the idea of structural embeddedness, indirect ties can offer firms the benefit of reducing the amount of time, costs and resources to gather and assimilate external information (Granovetter, 1985; Ahuja, 2000; Nahapiet and Ghoshal, 1998; Shane and Cable, 2002). In addition, through its indirect ties, a firm can receive information about relevant developments and knowledge beyond its core areas of expertise. In this way, indirect partners may also fulfill a 'radar' function by bringing broader information to the attention of the focal firm, far beyond its direct ties, and that it may miss otherwise (Freeman, 1991; Ahuja, 2000). Although the larger the social distance in a network, the smaller the probability of effective knowledge flows is, a two-step reach may generally suffice. It strikes a careful balance between accessing knowledge with a higher novelty value and being not too far away so that knowledge flows can still occur (Singh, 2003; Li and Rowley, 2002). This is in line with Burt's argument that brokerage is especially useful among unconnected indirect contacts in an ego-network rather than among indirect contacts beyond an ego-network (Burt, 2007). Furthermore, brokerage between two unconnected partners is more valuable to the extent that there is more tacit knowledge involved at a larger distance between them, and to the extent that behavioral norms and routines residing with each contact are more distant from one another (Hargadon and Sutton, 1997; Burt, 2007). As firms and universities exhibit substantial differences both in their (tacit) knowledge base and in their norms and institutionalized practices, these conditions seem to apply well in this context.

This general reasoning may explain why DBFs can serve as effective brokers between universities and (large) pharmaceutical companies (Stuart et al., 2007). Following the concept of relative absorptive capacity (Lane and Lubatkin, 1998), pharmaceutical firms may be better able to learn from universities via DBFs because they share similar knowledge and have compatible values and similar operational



priorities. For academic scientists, collaboration with DBFs is also attractive as they have sufficient absorptive capacity and are used to the norms and institutionalized practices in academia (Gittelman and Kogut, 2003). In this way, DBFs can act as intermediary organizations that tap into the knowledge and capabilities of academic scientists and manage the selection of scientific inventions in order to create commercially valuable technological innovations. More specifically, they may serve as value-added 'liaisons' by obtaining intellectual property from universities and by exchanging it with downstream partners, often after considerable own investments in subsequent development of the technology. This makes brokering an attractive role for DBFs, because the more agreements and collaborations they have with universities, the more they may be able to attract revenue-generating alliances with down-stream partners (George et al., 2002; Stuart et al., 2007).

The benefits of indirect ties notwithstanding, indirect ties also have drawbacks. Information from indirect ties may not be perfect but can be rather 'noisy' (e.g. Ahuja, 2000). It passes through a common partner, which may interpret and attach meaning to this information in a different way than the focal firm. In this process, fine-grained specificities may get lost and not reach the focal firm or possibly lead to misunderstanding from its side. In addition, the broker role of DBFs also implies the sharing of IP rights and an associated risk of distributional conflicts.

### **Hypotheses**

The extant literature suggests that there are benefits and costs involved with direct and indirect collaboration with universities. The degree to which benefits are likely to outweigh costs will vary among firms. We expect an important degree of firm heterogeneity, originating from the firm's R&D strategy and organization, which is likely to affect its capacity to absorb scientific knowledge and its ability to bridge profoundly different institutional environments (Cassiman and Gambardella, 2009). Prior research has shown that firms differ persistently in their knowledge base profiles and their institutionalized practices and routines in the field of R&D (D'Este, 2005; Bercovitz and Feldman, 2007; Cassiman et al., 2008).

An important aspect of R&D organization is the degree to which firms place particular emphasis on basic research rather than focusing only on applied research and development (Rosenberg, 1990; Bercovitz and Feldman, 2007; Fabrizio, 2009). Firms may hire in-house scientists, provide corporate support for their publication efforts in scientific journals and encourage them to comply with the norms and institutionalized practices as they operate in academia (Gittelman and Kogut, 2003). Such an adaptation of a firm's R&D organization focusing on the role of 'open science' and fundamental research, as apposed to applied research, may help firms to attract high quality researchers at relatively low cost (Stern, 1999) and provide legitimacy and reputation in the academic community, facilitating a degree of privileged access to frontier development in relevant academic fields (Cockburn and Henderson, 1998). It forms a supportive, science-oriented R&D organization that contributes to the build-up of 'scientific absorptive capacity'. Such scientific absorptive capacity contributes to easier communication with university researchers and to bridging the institutional distance with them, enhancing the build-up of trust between both parties. The role of trust is not only important for the exchange of tacit knowledge but also to alleviate the risk of conflict over the distribution of intellectual property rights (Bruneel et al., 2010).

Taken together, these factors are important organizational and contextual factors for successful collaboration between universities and firms (Mora-Valentin, 2004) formed by teams composed of researchers from both sides. These teams, working together at the 'laboratory bench', form a key transfer mechanism when knowledge has a large tacit component (Zucker et al., 2002; Balconi and Laboranti, 2006). Direct collaboration may be instrumental in speeding up the transfer of frontier academic knowledge to the firm (Fabrizio, 2009), potentially providing first mover advantages in applied research and leading to higher value inventions. For firms with a more outspoken science orientation in their R&D organization and a high scientific absorptive capacity, direct collaboration is likely to provide innovative performance benefits.

In contrast, indirect ties to universities through collaboration with DBFs may not contribute much to the innovative performance of firms with high scientific absorptive capacity for two reasons. First, to the extent that a focal firm has more scientific absorptive capacity, it may have more useful and unique expertise that other firms may want to acquire. DBFs, as the common partner between a focal firm and a university, often have alliances with other firms, creating a pathway for undesirable spillovers from the focal firm. Second, firms with high scientific absorptive capacity may be more interested in specific, fine-grained and tacit information that can only be obtained in direct exchange, whereas the less specific and noisier nature of indirect information may contribute little to their innovative performance.

Firms with low scientific absorptive capacity generally can have more to gain and less to lose from indirect ties to universities, for their innovative performance. First, they may not be able to effectively assimilate external knowledge and do not have a R&D organization that is well equipped to bridge institutional differences with academia. Here indirect ties to universities, through DBFs, are more likely to be effective in scientific knowledge sourcing. DBFs may serve both as a 'cognitive bridge' and as an 'institutional bridge', such that the focal firm can avoid the fundamental adaptations to its R&D organization necessary for direct collaboration. Second, firms with low scientific absorptive capacity have a comparatively limited research expertise and may have less to lose from potential knowledge spillovers through DBFs. In addition, the more general and rather noisy nature of indirect information may be offset by the benefits of providing a more comprehensive overview on unfamiliar domains and on key new developments, which firms with low scientific absorptive capacity are likely to lack. Indirect ties are therefore most likely to provide innovative performance benefits.

The above arguments lead to two related hypotheses:

**Hypothesis 1:** *For firms with low scientific absorptive capacity, indirect collaborative ties to universities have a positive impact on their innovative performance.*

**Hypothesis 2:** *For firms with high scientific absorptive capacity, direct collaboration with academia has a positive impact on their innovative performance.*

*University collaboration and inter-firm collaboration combined*

For firms in knowledge-intensive industries, research alliances with other firms have shown to be useful and performance improving (e.g. Powell et al. 1996; Rothaermel and Deeds, 2004; Ahuja 2000; Owen-Smith and Powell, 2004; Goertzen, 2007; Phelps, 2010). In addition, recent studies have emphasized that a combination of different types of technology collaborations is beneficial for innovative performance outcomes, as diversity of partners provide complementary insights and holds the promise of knowledge recombination (Belderbos, et al., 2006; Baum et al., 2000; Lavie 2007; Hoffman, 2007; Wassmer, 2010). However, it has also been noted that too much diversity in a firm's collaborative efforts with other firms may reduce the effectiveness of collaborations. Managerial resources may become too thinly spread, knowledge integration tends to become increasingly complex and firms generally start to suffer from information overload (Mowery et al., 1996; Lavie and Miller, 2008).

The difficulty of combining different collaboration strategies is likely to be more pronounced where it concerns efforts to collaborate with universities as well as private firms. While university collaboration is likely to be characterized by an emphasis on exploration, prioritizing projects with uncertain outcomes and higher risks of failure (Hall et al, 2000; Belderbos et al., 2004; 2006), technology collaboration with firms is generally aimed at applied research and more downstream parts of the innovation process (Faems et al., 2005). As noted above, the academic logic of scientific discovery differs profoundly from an industrial logic that characterizes the development of new technologies and their practical applications (Hall et al., 2000; Nelson, 2004).

Firms combining the two types of collaboration may face a number of obstacles. First, the large cognitive distance between firms and universities, at the dyad level, elevates the degree of cognitive diversity of a firm's entire portfolio. To deal with this diversity implies that firms need to deploy more (learning) resources to augment absorptive capacity, whereas the potential for synergy and recombination across its different partner types is reduced (Vasudeva and Anand, 2011). Second, there is a large institutional distance between a focal firm's partners on the one hand and its university partner(s) on the other. While effective direct collaboration with universities requires an adaptation of the R&D organization to improve its scientific absorptive capacity, effective collaboration with firms require a different research organization, different organizational routines, and different alliance capabilities. This implies a severe risk of incongruity between different organizational practices and routines (cf. Lavie et al., 2011), as the practices, routines and capabilities required for collaboration with universities differ profoundly from those that are geared towards collaboration with firms (Arora and Gambardella, 1990; Cockburn et al., 1999; Gittelman and Kogut, 2003; Belderbos et al., 2004; 2006; Faems et al., 2005; Bruneel et al., 2010). As a consequence, combining direct collaboration with universities and R&D alliances with firms requires the bridging of both distance and diversity, cognitively and institutionally. In general, this will pose a heavy burden on a firm's resources and capabilities because it not only increases organizational costs to reconcile the different demands but also elevates complexity that renders the collaborations less effective, making it difficult to combine the two. These arguments lead to the following hypothesis:

**Hypothesis 3:** *A strategy of combining direct collaboration with universities and*

*collaboration with firms has a negative effect on a firm's innovative performance.*

As argued above, a firm's R&D strategy and organization shapes both its ability to bridge cognitive distance and institutional distance, depending on the emphasis the firm places on developing new knowledge versus applying existing knowledge (Cassiman and Valentini, 2009). Below we argue that firms make this trade-off in a heterogeneous manner, which affects their ability to combine university collaboration with inter-firm collaboration. In general, firms possessing high scientific absorptive capacity will have a R&D organization with a focus on fundamental research. These firms will have more resources and capabilities at their disposal to bridge both the cognitive and institutional distance with universities.

A focus on fundamental research may influence the motivation and ability to innovate by providing key knowledge inputs to a firm's innovation process. The availability of state-of-the-art knowledge and expertise may encourage firms to invest in upscaling and commercialization (Dosi, 1982). In addition, notwithstanding the difficulty to combine basic, scientific research with applied research, the focus on basic and scientific research may have compensating benefits, increasing the effectiveness of applied research (Cassiman and Veugelers, 2006; Dasgupta and David, 1994). Organizations that are involved in basic research as part of their technology development activities may develop a deeper understanding of the fundamental principles of the phenomena under study (Rosenberg, 1990). Based on this understanding and by discovering novel causal relationships, scientific research can assess which trajectories may probably become dead-ends and which ones will be much more promising (Fleming and Sorenson, 2004). It may provide firms with a better understanding of the potential implications of applied research (Cassiman et al., 2008; Cassiman and Valentini, 2009; Gambardella, 1992) and may also provide them with heuristics that enable them to better assess the likelihood of success of certain innovation trajectories (Fleming and Sorenson, 2004). The efficiency of applied research may improve as firms may be better able to anticipate the results of research experiments without performing them, helping to prioritize innovation projects based on their expected values (Fabrizio, 2009). These capabilities will aid firms in the effective selection and focus of applied inter-firm research collaborations and may help them to correctly interpret and build on the outcomes of such applied research, increasing the effectiveness of applied collaborative research efforts with other firms. High scientific absorptive capacity then supports a focal firm in its ability to mitigate or neutralize the diseconomies of joint engagement in university and inter-firm alliances as argued above.

**Hypothesis 4:** *Firms with high scientific absorptive capacity are able to mitigate the negative impact of joint engagement in direct collaboration with universities and inter-firm R&D collaboration on innovative performance*

As noted above, for firms with low scientific absorptive capacity, a combination of direct collaboration with universities and research collaboration with firms will be above and beyond their capabilities. As these firms lack the ability to bridge the large cognitive and institutional distance with universities, the elevated diversity of their portfolio will carry a negative effect on their innovative performance. However, the potential diseconomies related to the diversity in collaboration partners is not likely to be pronounced if inter-firm collaboration is combined with indirect ties to universities. The latter do not require any profound changes to the R&D organization nor to their alliance capabilities, since the indirect ties to universities research through DBFs allow the firm to maintain its focus on firms only in its alliance portfolio. Moreover, the brokering role by DBFs eliminates the problem of bridging the large institutional distance with universities and supports firms in bridging the cognitive distance with universities. Low scientific absorptive capacity firms share similar characteristics -in terms of knowledge bases, values, and operational priorities - with DBFs as compared to universities, and this facilitates learning. Thus we hypothesize:

**Hypothesis 5:** *Low absorptive capacity firms experience no negative performance consequences of a strategy combining indirect ties to universities with inter-firm R&D collaboration.*

## **Data and Empirical Methods**

### *Sample and Data*

We constructed a panel dataset (1995-2002) on 40 of the largest EU, US and Japanese pharmaceutical firms. The firms were selected from the 2004 EU Industrial R&D Investment Scoreboard'. This scoreboard lists the top 500 corporate investors in R&D based in the EU, and the top 500 companies based outside the EU. We collected information on the firms' patent applications at the European Patent Office (EPO) at the consolidated level, i.e. taking into account patents of the parent

firm and all its consolidated (majority-owned) subsidiaries. We also collected information on the scientific publication efforts of the firms. We extracted publication data from yearly updates of the Science Citation Index database of ISI/Thomson Scientific, including peer-reviewed papers of the types article, letter, note and review. Alliance data were drawn from the CATI database (Hagedoorn, 2002) on strategic alliances as well as the RECAP (Recombinant Capital) database. The latter alliance database is a comprehensive source on publicly announced alliances in the biomedical fields collected from press releases, SEC filings, and industry presentations. Finally, we collected accounting data from the Worldscope and Compustat databases. In all this resulted in an almost balanced panel dataset on firms' citation weighted patents with 309 observations.<sup>1</sup>

#### *Variables and Measures*

We measure the innovative performance of the sample firms (the dependent variable) in a particular year as the count the number of forward patent citations received by the patents applied for by the firm in the biotechnology field in a year. We measure patent citations over a fixed time window of 5 years. This 'weighting' by the forward patent citations allows controlling for variation in the value and technological importance of patented inventions (Harhoff et al, 1999; Hall et al, 2005). In particular in the pharmaceutical industry, patents and patent citations are a relevant indicator of innovative performance and closely linked to market valuation (Harhoff et al., 2003, Hall et al., 2005)

We construct three different R&D collaboration variables to capture engagement in the different collaboration strategies by the pharmaceutical firms. The number of direct R&D collaboration agreements with universities is calculated by drawing on the RECAP database. We focus on research collaborations and exclude licensing and other non-collaborative agreements, while limiting the count to alliances in the biotech field to maintain consistence with the focus of the dependent variable. The number of indirect ties to universities brokered by dedicated biotech firms is measured as the number of research collaborations in biotechnology between universities and the DBF partners of the pharmaceutical firm. Finally, the number of inter-firm R&D alliances is the number of cooperative research agreements in the biotech field with partner firms that are not collaborating directly on biotech research with universities (drawing on the CATI database). We count the number of active collaborations and ties in a year. We identify the first and final years of the period during which the agreements were valid if information was available. In case no information was available on the dissolution of agreements, the length of the agreement was assumed to be five years (Stuart, 2000; Lavie, 2007).

A firm's scientific absorptive capacity is measured as the number of scientific publications on which the firm or its subsidiaries are listed as the affiliations of one of the authors. We scale the number of publications by the number of prior patent applications to avoid that the measure is picking up a mere size effect and to ensure that it is reflective of the orientation towards scientific research of the firms' R&D activities. Engagement in in-house scientific research as evidenced by scientific publications is a clear indication of the presence of in-house scientists and an R&D organization facilitating the absorption and utilization of scientific knowledge (e.g. Gambardella, 1992; Cockburn and Henderson, 1998).

Our analysis controls for the impact of unobserved firm heterogeneity by including fixed firm effects. In addition, we include a set of time-variant firm characteristics that are likely to affect the innovative performance of firms. We control for a firm's research and development expenditures in the biotechnology field in the past year, since the technological performance of firms is influenced by the amount of capital invested in R&D activities. As data on R&D expenditures dedicated to biotechnology is not available, we estimate the relevant R&D input by multiplying a firm's total R&D expenditures by the share of its biotechnological activity in the total technological activity. The share of biotechnological innovation activity is approximated by the share of biotechnology patents in the total number of the firm's patents. Our analysis also controls for potential differences across firms in the propensity to patent by including the patent to R&D expenditure ratio, and includes the main effect of scientific absorptive capacity measured as firm's publication count scaled by its patent applications. The empirical models include year dummies to account for time-specific factors that may affect the number of firms' patents and citations.

All explanatory variables are measured one year prior to the dependent variable. Summary statistics

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<sup>1</sup> In a few cases, we observe the firms shorter than the 8-year period, e.g. if the firm was created as the result of a merger (e.g. AstraZeneca and Aventis).

and correlations for the variables are provided in Tables 1 and 2.

**Table 1 Descriptives**

Variables	Full Sample		High Scientific		Low Scientific	
			Abso. Cap. Firms		Abso. Cap. Firms	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Citation Weighted Biotech Patents	26,60	31,61	19,53	23,40	33,01	36,44
Direct University Collaborations	0,54	2,11	0,22	0,71	0,82	2,81
Indirect University Ties	5,04	7,84	3,35	5,34	6,57	9,31
Inter-firm Collaborations	6,32	7,00	5,61	6,36	6,96	7,50
Biotech R&D expenditure	0,08	0,47	0,01	0,07	0,15	0,64
Patent Propensity	0,16	0,20	0,14	0,23	0,18	0,17
Scientific Absorptive Capacity	3,78	2,51	5,52	2,50	2,20	1,03

**Table 2 Correlations**

Variables	1	2	3	4	5	6	
1 Citation Weighted Biotech Patents							
2 Direct University Collaborations		0,09					
3 Indirect University Ties		0,48	0,16				
4 Inter-firm Collaborations		0,49	0,17	0,56			
5 Biotech R&D expenditure		0,02	-0,04	-0,10	0,09		
6 Patent Propensity		0,05	0,03	-0,03	-0,16	-0,14	
7 Scientific Absorptive Capacity		-0,06	-0,09	-0,07	0,03	-0,02	-0,31

### Methods

Since the dependent variable takes nonnegative integer values, we use Negative Binomial Regression models to relate innovative performance to collaboration strategies and scientific absorptive capacity. To investigate the heterogeneous effect of alliances for firms with different scientific absorptive capacity, we conduct split sample analysis by dividing the sample into two subsamples: firms with high and low scientific absorptive capacity. For the division of the sample, we use as a cutoff point the median value of the average scientific absorptive capacity during the investigation period. Hypotheses 1 and 2 are then tested by examining the coefficients for indirect collaborative ties and direct university collaboration of the two subsamples. Hypotheses 3 and 4 are tested by including the interaction effect between inter-firm alliances and direct university collaboration. Hypothesis 5 is tested by including the interaction effect of inter-firm alliances and indirect ties to universities in the subsample analysis on low absorptive capacity firms. All interacted variables are demeaned before interactive measures are calculated.

### Empirical Results

The results of the fixed effects Negative Binomial Analysis relating the firms' innovative performance to their collaboration strategies and the other firm characteristics are presented in Table 2. We first estimated models on the full sample (Model 1), and subsequently estimate models separately for firms with a high and low scientific absorptive capacity (Models 2 and 3). In Models 4 to 6, we test specifications with the interaction term between university collaboration and inter-firm collaboration included (hypotheses 3 and 4).

In Model 1, we do not find a significant effect of direct collaborations with university on the innovative performance of the pharmaceutical firms, while inter-firm R&D collaborations have a positive and significant impact. When we split the sample into two groups based on firms' scientific absorptive capacity however, contrasting results are observed. Direct collaborations with universities have a positive and significant effect on innovative performance for firms with high absorptive capacity, in support of Hypothesis 1. In contrast, indirect ties to universities have a positive and significant impact on innovative performance for low absorptive capacity firms, which supports Hypothesis 2.

**Table 3 Results of fixed effects negative binomial models of the innovative performance of pharmaceutical firms, 1995-2002**

	Full Sample	High Scientific Abs. Cap.	Low Scientific Abso. Cap.	Full Sample	High Scientific Abs. Cap.	Low Scientific Abs. Cap.
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Direct University Collaborations	-0.0270 (0.0296)	0.1808** (0.0782)	-0.0533 (0.0400)	-0.0087 (0.0387)	0.1421 (0.0979)	0.0116 (0.0388)
Indirect University Ties	0.0094 (0.0064)	0.0085 (0.0114)	0.0143* (0.0078)	0.0146* (0.0081)	0.0116 (0.0138)	0.0168* (0.0098)
Inter-firm Collaborations	0.0300*** (0.0104)	0.0475*** (0.0152)	0.0325** (0.0140)	0.0358*** (0.0113)	0.0472** (0.0185)	0.0402*** (0.0155)
Direct Univ. Coll.* Inter-firm Coll.				-0.0054 (0.0077)	0.0046 (0.0070)	-0.0208** (0.0089)
Indirect Univ. Ties*Inter-firm Coll.				-0.0013 (0.0011)	-0.0008 (0.0023)	-0.0011 (0.0012)
Biotech R&D expenditure	0.5280*** (0.1592)	-0.8329 (1.0167)	0.5184*** (0.1646)	0.5234*** (0.1577)	-0.8146 (1.0171)	0.4753*** (0.1616)
Patent Propensity	0.4597 (0.2919)	0.1869 (0.3671)	0.7324 (0.6073)	0.4223 (0.2948)	0.1651 (0.3675)	0.6876 (0.6062)
Scientific Absorptive Capacity	0.1089*** (0.0345)	0.0925** (0.0388)	0.1096 (0.1126)	0.1033*** (0.0347)	0.0933** (0.0394)	0.1371 (0.1074)
Year 1996	0.0327 (0.1416)	-0.0588 (0.1797)	0.0469 (0.2014)	0.0413 (0.1409)	-0.0447 (0.1807)	0.0882 (0.1962)
Year 1997	0.0310 (0.1432)	-0.0747 (0.1804)	-0.0462 (0.2107)	0.0686 (0.1443)	-0.0490 (0.1837)	0.0551 (0.2101)
Year 1998	-0.0787 (0.1451)	-0.5629*** (0.2048)	0.1299 (0.2025)	-0.0813 (0.1452)	-0.5408** (0.2139)	0.1955 (0.2001)
Year 1999	0.0369 (0.1431)	-0.1959 (0.1837)	0.1201 (0.2048)	0.0227 (0.1439)	-0.1830 (0.1895)	0.1412 (0.2020)
Year 2000	0.0001 (0.1462)	-0.3546* (0.1921)	0.1515 (0.2094)	-0.0154 (0.1467)	-0.3427* (0.1973)	0.1846 (0.2091)
Year 2001	-0.2190 (0.1519)	-0.3550* (0.1835)	-0.1812 (0.2255)	-0.2459 (0.1535)	-0.3235* (0.1953)	-0.2208 (0.2269)
Year 2002	-1.0178*** (0.1793)	-1.2174*** (0.2233)	-0.9406*** (0.2600)	-1.0399*** (0.1802)	-1.1647*** (0.2353)	-0.9448*** (0.2553)
Constant	0.7477*** (0.2067)	1.5215*** (0.3282)	0.5273 (0.3846)	0.8181*** (0.2093)	1.5204*** (0.3433)	0.5657 (0.3680)
No. of Observations	309	147	162	309	147	162
No. of Firms	43	21	22	43	21	22
Log Likelihood	-885.7	-367.9	-508.0	-884.5	-367.7	-504.8

Notes: Standard errors in parentheses, \* p<0.1, \*\* p<0.05, \*\*\* p<0.01

The results of Model 4 (full sample), with the interaction terms included, show no significant impact of combining direct university collaboration, or indirect university ties, with inter-firm R&D collaboration. In the split sample analysis, however, we observe a negative effect of the interaction term between direct university collaboration and inter-firm alliances for low absorptive capacity firms (Model 6), in support of Hypothesis 3. No such significant effect is observed for high absorptive capacity firms (Model 5), as suggested by Hypothesis 4. The interaction effects between indirect university ties and inter-firm R&D alliances are insignificant throughout, suggesting that negative performance consequences are restricted to the combination of direct collaboration with universities and firms. This is consistent with the prediction of Hypothesis 5.

In non-linear models, the sign and significance of the interaction variable is no definitive indication of the sign and significance of the moderating effect the interacted variables have on each other. To examine more precisely the negative interaction effect between direct university ties and inter-firm alliances in Model 6, we calculated the value and standard error of the cross-derivative for all sample observations in this model. The cross-derivative took negative values for more than 94 percent of sample observations and was significantly negative (at the 10 percent level) for 63 percent of the sample observations. These findings confirm that firms with low scientific absorptive capacity experience see the benefits of inter-firm alliances significantly reduced when they simultaneously engage in direct collaboration with universities.

### Discussion and Conclusions

In the literature, two different views on firm - university collaboration co-exist. In the industry-science literature the importance of direct collaboration between firms and universities is endorsed, especially in knowledge-intensive industries (Cohen et al., 2002; Zucker and Darby, 2001; Zucker et al., 2001; 2002). On the other hand, in the innovation and strategic alliance literature the role of brokerage through DBFs, as specialized go-betweens, is emphasized (Powell et al., 1996; George et al., 2002; Pisano, 1991; Stuart et al., 2007). We have argued that the degree of a firm's scientific absorptive capacity forms an important contingency factor that determines to what extent firms can benefit from collaboration with universities, direct, or through indirect ties brokered by DBFs. Our results provide support for these ideas and corresponding hypotheses. Firms with high scientific absorptive capacity benefit mostly from direct collaboration with universities, whereas for firms with low scientific absorptive capacity indirect collaboration forms the best strategy to improve innovative performance.

A second issue addressed in this study is how a combination of direct collaboration with universities and research collaboration with firms affects a firm's innovative performance. Our findings indicate that for firms with low scientific absorptive capacity, the effect of joint collaboration strategies with universities and firms is distinctly negative, while for high absorptive capacity firms such joint collaboration strategies are neutral in impact. As we argued, combining the two requires the bridging of both distance and diversity, cognitively and institutionally, within a firm's portfolio of collaborations. As this will pose a high burden on a firm's resources and capabilities, it becomes difficult to combine the two effectively. For firms with low scientific absorptive capacity, an appropriate strategy to remedy this is formed by a combination of indirect ties to universities and research collaboration with firms. Direct university collaboration undermines the benefits of their inter-firm research alliances. In contrast, firms with high scientific absorptive capacity are better able to mitigate the negative impact of joint engagement in direct collaboration with universities and research collaboration with firms. Although this is in line with earlier findings that firms with large internal knowledge stocks are most likely to combine this with different external linkages strategies (Arora and Gambardella, 1990), our findings show that this may not necessarily boost a firm's innovative performance. High scientific absorptive capacity is effective to remedy the negative effect of such a dual strategy, but does not suffice for obtaining synergy benefits from it.

Our study contributes to a variety of strands in the literature on R&D collaboration, alliances and innovation. We inform the industry - science literature by demonstrating that the value of direct collaboration with universities is not useful for all firms, but contingent on the level of a firm's scientific absorptive capacity. If firms have a relatively low level of scientific absorptive capacity, a far more effective strategy is formed by collaborating with DBFs to establish indirect ties to university research. The existence of an alternative strategy to source scientific knowledge through indirect ties forms an overlooked issue in this literature and counters the common idea that in science-based industries, one should be proximate and collaborate directly with PROs (Zucker and Darby, 2001; Zucker et al., 2002; Arundel and Geuna, 2004; Cassiman et al., 2008). Furthermore, we inform this literature by showing that the effectiveness of direct collaboration with universities is also influenced by the degree to which firms simultaneously collaborate with other firms. Both types of collaboration need to be considered in combination in order to account for their mutual influence.

Our findings also inform the innovation and strategic collaboration literature by showing that a strategy of indirect ties to universities only works for firms with relatively low levels of scientific absorptive capacity. For high scientific absorptive capacity firms, indirect collaboration is not effective as it brings little new information and may increase the risk of spillovers via DBFs to their competitors. The emphasis in the strategic alliance literature has been particularly placed on the value of the brokerage role fulfilled by DBFs (Pisano, 1991; Howells, 2006; Stuart et al., 2007), implicitly treating the firm partners of DBFs as a homogenous group with similar resources and in-house expertise. The latter forms a serious omission as our findings show that there is substantial firm heterogeneity in the degree of scientific absorptive capacity and hence the benefits of brokered ties.

We also contribute to the (alliance) portfolio literature in a number of ways. In this literature, diversity of a firm's portfolio of collaborations has been demonstrated to carry a positive effect (e.g. Phelps, 2010) or a curvilinear effect (e.g. Deeds and Hill, 1996) on performance. Here, portfolios have mostly been considered as consisting of alliances with various firms as partners, but generally not as including universities as partners. Our analysis has considered a higher degree of diversity by including both firms and universities in firms' collaboration portfolios, to include consideration of the role of

different partner *types*. This brings along a new coordination issue as firms need to bridge not only cognitive distances but also institutional distances among their different partners, with the degree of diversity increasing both along the cognitive and institutional dimension. This increases not only a firm's organizational costs to reconcile the different demands, but also elevates complexity that may render the collaborations less effective. As a consequence, combining inter-firm alliances and direct collaboration with universities can have a distinctive negative effect on a firm's innovative performance; unless it disposes over high scientific absorptive capacity that allows it to mitigate the negative performance consequences. Hence, the performance effects of a portfolio that is configured by firms and universities are moderated by a firm's scientific absorptive capacity. In this way, we also shed some more light on the role of contingency factors that may enhance or inhibit portfolio effects, which has been an important void in the literature until now (Wassmer, 2011).

A limitation of our study is that we do not consider partner attributes such as their differences in technological expertise and/or nationality. In a similar vein, we do not control for heterogeneity in the strength and/or reputation of the universities that firms collaborate with (Stuart et al., 2007). This suggests an interesting issue for future research as it has been suggested that collaborations with partners with rich resources tend to provide firms with access to more valuable knowledge that may elevate the potential for recombination with their internal knowledge base (Dyer and Singh, 1998; Srivastava and Gnyawali, 2011). Another limitation of our study may be formed by the potential lack of generalization beyond science-based industries. The findings of our study may only be generalized to other industries to the extent that these are also characterized by a key role of public research in industrial innovation and the ability of intermediary firms that can effectively secure the intellectual property rights for novel scientific inventions. Examples of this may be formed, among others, by microelectronics, advanced materials and nanotechnology (Lavie and Drori, 2011; Baba et al., 2009).

Overall, we contribute to a more in-depth understanding of the still poorly understood, multifaceted nature of the links between science and industry (e.g. George et al., 2002; Bruneel et al, 2010). More specifically, we shed some more light on how university collaboration - direct or indirect - contributes to a firm's innovative performance, an issue that still remains understudied. Furthermore, we may explain a somewhat paradoxical issue. Given that direct collaboration with academia is highly skewed among firms (Belderbos et al., 2006; Cassiman et al., 2008), how is the majority of firms still able to survive and prosper without direct collaboration with academia? Especially as they operate in science-based fields in which there is an ongoing intensification of the interactions between universities and industry such as in pharmaceutical biotechnology (e.g. Hall et al., 2000; Owen-Smith et al., 2004; Branstetter and Ogura, 2005). This is all the more relevant as other direct routes to academia, other than formal collaboration such as transfer of personnel, scientific publications, investing in start-ups will also require sufficient scientific absorptive capacity. We show that by seeking indirect ties with universities, firms may be able to remedy their lack of scientific absorptive capacity and still reap benefits of university research.

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## Alliance Portfolio Diversity and Technological Diversification within Firms: An Empirical Exploration of the Pharmaceutical Industry

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**Abstract:** Whereas existing studies have examined the impact of alliance portfolio diversity on firms' technological performance (i.e. number of patent applications), this study will analyse its effect on firms' technological diversification (i.e. variety of patent applications in terms of technological classes). In this way, we are able to evaluate the impact of alliance portfolios on the quality of technology portfolios rather than its impact on the quantitative output. Merging data from the Thomson SDC database and the EPO database, we create a unique panel dataset (i.e. between 1995 and 2002) for the 43 largest Pharmaceutical firms. The results show that alliance portfolio industry diversity has a positive impact, while alliance portfolio functional diversity has a U-shape relationship with firms' technological diversification. Jointly, these findings indicate that alliance portfolios can be used as a strategic tool to diversify firms' technological capabilities.

**Key words:** Alliance portfolios; Industry diversity; Functional diversity; Geographical diversity; Technological diversification

### 1 Introduction

Firms increasingly use open innovation models in which they rely on strategic alliances, or 'any voluntary initiated interfirm cooperative agreement that involves knowledge sharing, or co-development' (Gulati, 1995, p. 619), to complement their internal innovation activities (Hagedoorn, 2002; Cassiman and Veugelers, 2006; Faems et al., 2010). Although the literature initially focused on individual alliances, various scholars have stressed the importance of evaluating all operational alliances of a firm together as a portfolio (George et al., 2001; Lavie, 2007; Wassmer, 2010; Wassmer and Dussauge, 2011). At the portfolio level, synergies and constraints between alliances can be identified (Parise and Casher, 2003), which can subsequently help to increase the overall value of a firm's alliance portfolio (Wassmer and Dussauge, 2011)

Recent studies on alliance portfolios (e.g. Nooteboom et al., 2007; Luo and Deng, 2009; Phelps, 2010; Vasudeva and Anand, 2011) have examined the effect of alliance portfolio diversity, i.e. the extent to which a firm forms alliances with different types of partners, on the technology portfolio of firms. In general, these studies suggest that a moderate level of diversity results in a larger technology portfolio, i.e. the number of patents increases, rather than a low or high level of diversity. At the same time, the literature remains relatively silent on the impact of alliance portfolio diversity on the technological diversification of firms, i.e. the ability of firms to patent in a variety of technological domains. This gap is important, because in order to increase our understanding of alliance portfolios, it is important to evaluate its impact on the quantity as well as the quality of technology portfolios as argued by Antonelli and Calderini (2008). Furthermore, several studies find a positive impact of technological diversification on the financial and innovation performance of companies (Antonelli and Calderini, 2008; Belderbos et al., 2010; Chen and Chang, 2010).

Hence, the goal of this study is to explore the relationship between alliance portfolio diversity and technological diversification. Based on the organizational learning theory and the knowledge-based view of the firm, we hypothesize that access to a variety of knowledge contributes to the creation of new linkages and combinations, and therefore, has a positive impact on technological diversification. Following Jiang et al. (2010) and Duysters and Lokshin (2011), we argue that alliance portfolio diversity is a multi-dimensional construct. More specifically, this study distinguishes between the effect of alliance portfolio industry diversity, alliance portfolio functional diversity and alliance portfolio geographical diversity. These dimensions are motivated by different mechanisms and strategic reasons.

In order to test our hypotheses, a unique panel dataset is created, comprising archival data on alliance activities from the Thompson SDC database and data on patent applications from the EPO database for the 43 largest Pharmaceutical firms. For each firm, we subsequently created alliance portfolios and patent portfolios for a time period of eight years (1995 – 2002). Based on the results of a

Hausman test, we estimated our models by conducting fixed effects regression analyses.

The results of our study show that alliance portfolio diversity has a significant impact on the technological diversification of firms. More specifically, we found support for a positive effect of alliance portfolio industry diversity. For the other hypotheses, the nature of the relationships diverted from what was hypothesized. Alliance portfolio functional diversity is shown to have a U-shape relation with firms' technological diversification, whereas the relation between alliance portfolio geographical diversity and technological diversification is found to be insignificant.

Our findings contribute to existing alliance portfolio research by empirically demonstrating that alliance portfolio diversity does not only influence the *size* of firms' patent portfolios, but also has a substantial impact on the *composition* of the patent portfolio. In this way, this research shows that access to a variety of knowledge sources not only facilitates the development of new ideas and knowledge, as argued by the organizational learning theory and the knowledge-based view, but it also broadens the scope of this new knowledge. This is an interesting contribution to the existing literature, because it indicates that firms can rely on alliance portfolios as a strategic tool to diversify their technological portfolio. Our study also emphasizes the need to make an explicit distinction between different dimensions of alliance portfolio diversity, showing that alliance portfolio industry diversity, alliance portfolio functional diversity, and alliance portfolio geographical diversity have a differential impact on technological diversification.

This paper will now proceed as follows; the next section will discuss the theoretical background of this study by relating alliance portfolio diversity to technological diversification. We also elaborate on the different dimensions of alliance portfolio diversity and subsequently derive the hypotheses. Thereafter, the methodology is described that is used to conduct this study and the empirical results are presented. The remaining sections will discuss the results in more depth, suggest avenues for further research and conclude the main findings of this study.

## 2 Alliance Portfolio Diversity and Technological Portfolios

One of the most frequently studied compositional characteristics of firms' alliance portfolios is its diversity. Alliance portfolio diversity is commonly conceptualized as the extent to which a firm forms alliances with different types of partners (Luo and Deng, 2009; Sarkar et al., 2009; Faems et al., 2010; Sivakumar et al., 2011) or gains access to different types of knowledge, i.e. the diversity of patents owned by the alliance partners (Phelps, 2010; Lin, 2011; Vasudeva and Anand, 2011).

A portfolio of different types of alliances exposes companies to many and a variety of ideas and knowledge, which contributes to the development of innovations (George et al., 2001). In accordance, Duysters and Lokshin (2011) find that alliance portfolios of innovators are more diverse in terms of type of partners and nationalities than firms that do not innovate. On the other hand, diverse portfolios are also more complex to manage and more vulnerable to conflicts. This increases coordination and managerial costs (Jiang et al., 2010).

While the majority of the existing literature (e.g. Luo and Deng, 2009; Sarkar et al., 2009; Faems et al., 2010; Sivakumar et al., 2011) measures alliance portfolio diversity as a single dimension, recently scholars have started to study diversity in more detail by developing multi-dimensional constructs (Jiang et al., 2010; Duysters and Lokshin, 2011). Duysters and Lokshin (2011) extend the type of partner with a distinction between national and international alliances. In addition, rather than only looking at the characteristics of the alliance partners, Jiang et al. (2010) consider the characteristics of the alliances themselves, such as their functional purposes and governance structures.

Recent research has examined whether alliance portfolio diversity increases the *size* of firms' technology portfolios, i.e. the generation of patents. Although these studies operationalize the construct 'alliance portfolio diversity' in different ways, they reach the same conclusion, namely that the relationship is found to have an inverted U-shape (Nooteboom et al., 2007; Luo and Deng, 2009). This indicates that a moderate level of alliance portfolio diversity leads to a higher level of technological performance in comparison to a low or high level of diversity. An overview of the existing literature that examines this relationship is provided in table 1.

In addition, Vasudeva and Anand (2011) have examined the impact of alliance portfolios on the *importance* of a firm's technology portfolio, i.e. the number of citations that a patent portfolio received, rather than the effect on its size. The results of their study show an inverted U-shaped relation with the number of citations that a technology portfolio received.

**Table 1 The Existing Literature on the Link between Alliance Portfolio Diversity and Technology Portfolios**

Article	Theoretical Background	Independent Variable	Operationalization	Dependent Variable	Operationalization	Result
Nooteboom et al. (2007)	Resource-based view; organizational learning; absorptive capacity	Cognitive distance	Average of the correlations between the focal firm's technology profile and that of each of its alliance partners	Technological performance	Number of patents, with a distinction between more exploitative and explorative patents	Inverted U-shaped relation, with a stronger effect in exploration than in exploitation
Luo and Deng (2009)	Social network; organizational learning; organizational ecology and institutional perspectives	Similarity	Percentage of similar partners in a focal DBF's alliance portfolio	Innovation	Number of patents issued to the firm in a year	Inverted U-shaped relation
Phelps (2010)	Recombinatory search; social network	Network technological diversity	Knowledge distance between a focal actor and each of its partners and the distances among the partners	Exploratory innovation	New patent citations divided by total patent citations for each year per firm (7 year window)	Positive effect
Vasudeva and Anand (2011)	Absorptive capacity; organizational learning	Technological diversity	Pooling of the patents of all alliance partners in each focal firm's portfolio	Knowledge utilization from portfolio	Citation-weighted patent count in the lagged five-year window following an observation year	Inverted U-shaped relation

Furthermore, Phelps (2010) only focuses on exploratory innovations and finds that a highly diversified alliance portfolio is positively related to this type of innovations, which is measured by counting only the new patent citations. However, most companies actually conduct exploratory and exploitative activities simultaneously. They commonly use knowledge that is very similar to their own knowledge to exploit existing activities and knowledge that is very diverse for exploratory activities (Tushman and O'Reilly, 1996). This indicates that a balance between access to similar and diverse knowledge yields the largest amount of new patents, which advocates composing an alliance portfolio with a moderate level of diversity.

While the existing literature concentrates on the economies of scale, i.e. the generation of more patents (citations), the performance advantage in R&D activities appears to lie in economies of scope (Quintana-García and Benavides-Velasco, 2008). Rather than counting the number of (cited) patents, examining the impact on the diversity of the patents, i.e. the technological diversification of firms, can yield interesting results. Moreover, Antonelli and Calderini (2008) state that it is important to evaluate both the quantity as well as the quality of technology portfolios in order to get a real understanding of the technological competences of firms. However, to the extent of our knowledge, the relationship between alliance portfolio diversity and technological diversification has remained unexplored. Next, the concept of technological diversification will be briefly discussed, where after we will elaborate on its relationship with alliance portfolio diversity.

### 3 The Relevance of Technological Diversification

Quintana-García and Benavides-Velasco (2008) define technological diversification as 'the diversity in the knowledge system and principles underlying the nature of products and their methods of production' (p. 492), or, to put it differently, it is the ability of firms to patent in different technological domains. It can also be seen as a reflection of a firm's knowledge portfolio.

A small number of studies have studied the impact of technological diversification on the financial performance of firms (see table 2 for an overview). First of all, the study of Antonelli and Calderini (2008) shows that technological diversification has, next to the number of patents, a positive and significant effect on the market share of the studied companies. Second, Chen and Chang (2010) find that firms with a diverse technology portfolio have a higher market value, measured by stocks,

compared to companies with a more focused portfolio. Moreover, the study of Belderbos et al. (2010) shows a peak in the financial performance of firms, when their technology portfolio is balanced in terms of explorative and exploitative activities, i.e. a high level of technological diversification. Technological diversification can also enhance a firm's investments in R&D as found by Garcia-Vega (2006).

**Table 2 The existing literature on the effect of technological diversification**

Article	Theoretical Background	Independent Variable	Operationalization	Dependent Variable	Operationalization	Result
Garcia-Vega (2006)	No specific theory is addressed	Diversification	1 – Herfindahl index of concentration of a patent portfolio	Innovative activity	(1) R&D intensity (R&D / sales) (2) Number of patents	Positive relations
Leten et al. (2007)	No specific theory is addressed	Technological diversification	The spread of the patent portfolio over technological classes (Herfindahl index)	Patents	Yearly number of firm EPO applications	Inverted U-shaped relation
Antonelli and Calderini (2008)	Economics of knowledge	Knowledge compositeness	Weighted measure of differentiation that provides a fair account of the knowledge compositeness of company's portfolio.	(Technological ) Market share	(1) Relative share of patents owned by each car maker over the patent production in a given year. (2) Markets shares	One and two year positive lagged effects
Quintana-García and Benavides-Velasco (2008)	Evolutionary theory and technological trajectories; organizational learning; absorptive capacity	Technological diversification	Herfindahl index: $1 - \sum(p_i^2)$ , where p is the proportion in a firm of patents in technological field i.	Innovative competence	Number of patents granted by the firm in a year	Positive relation (larger impact on exploratory innovative competence than on exploitative innovative competence)
Belderbos et al. (2010)	Absorptive capacity	Technological activities	Share of explorative technological activities (situated in a technology domain that is new or unfamiliar to the firm in the past 5 years)	Financial performance	Tobin's Q, which is a ratio of the market value of a firm and the book value of the firm's assets	An inverted U-shape
Chen and Chang (2010)	No specific theory is addressed	HHI of patents	Herfindahl index of patent classes of a firm	Market value	Average stock price of a company in a given year multiplied by the number of common stock shares outstanding	Negative relation
Phelps (2010)	Recombinatory search; social network	Technological diversification	The spread of the patent portfolio over technological classes (Herfindahl index)	Exploratory innovation	New patent citations divided by total patent citations for each year per firm (7 year window)	Positive relation

Furthermore, owning patents in a large variety of technological fields facilitates the creation of new patents as technological diversification is found to increase the number of (cited) patents (Garcia-Vega,



2006; Quintana-García and Benavides-Velasco, 2008; Phelps, 2010). On the other hand, the results of Leten et al. (2007) show an inverted U-shaped relation between technological diversification and the number of patent applications, indicating that a moderate level of technological diversification leads to the highest technological performance. They argue that besides the positive effects of a higher level of technological diversification, there also additional coordination and integration costs.

Finally, Quintana-García and Benavides-Velasco (2008) have examined how technological diversification affects different types of innovation, i.e. exploration and exploitation. Although positive and significant results are found for both types, technological diversification has a larger effect on exploratory patents. Moreover, these authors stress that it is important for firms to develop capabilities to balance exploratory and exploitative activities. The positive effect of technological diversity on exploratory innovation is also confirmed by Phelps (2010). In his study, technological diversification is found to increase the relative share of new patent citations.

In conclusion, the above standing studies clearly show the positive impact of technological diversification on the financial and innovation performance of firms (see also table 2). As we already briefly addressed in the previous section, the link between alliance portfolio diversity and technological diversification has not been studied so far. This is an interesting gap, because both alliance portfolios and technological diversification are shown to be valuable for firms. Moreover, existing research has shown that alliance portfolio diversity has a significant impact on the quantity of firms' technology portfolio, whereas it is also interesting to examine whether it affects the quality of technology portfolios. Next, we will explore the relationship between alliance portfolio diversity and technological diversification in more depth. In this current study, we also aim to examine the effect of different dimensions of alliance portfolio diversity. Three dimensions will be considered to have an influence, namely alliance portfolio industry diversity, alliance portfolio functional diversity and alliance portfolio geographical diversity.

#### **4 The Relationship Between Different Types of Alliance Portfolio Diversity and Technological Diversification**

According to organizational learning theories, access to heterogeneous contexts facilitates the creation of new knowledge. A diverse alliance portfolio exposes a firm to variety of knowledge, ideas and experiences (Levitt and March, 1988; Levinthal and March, 1993; George et al., 2001), which facilitates the creation of new linkages between internal knowledge and incoming, i.e. external, knowledge (Cohen and Levinthal, 1990; Lin, 2011). The above standing process of combining internal and external knowledge can result in the creation of patents in unfamiliar technological domains, which subsequently increases the diversity of a firm's technology portfolio.

Moreover, the exposure to multiple sources of knowledge minimizes the risk that existing capabilities will be exhausted, i.e. problems of redundancy (Vasudeva and Anand, 2011). In this way, the continuous access to new, unfamiliar knowledge will facilitate the development of new ideas. This access will also increase the probability that new incoming information is related to existing knowledge base, and therefore provides a more robust setting for learning to take place (Cohen and Levinthal, 1990; Powell et al., 1996). Additionally, there is a higher probability that at least some of the obtained knowledge will lead to a successful innovation outcome as argued by Leiponen and Helfat (2010).

Although Cohen and Levinthal (1990) state that learning is difficult in novel domains, knowledge diversity can increase the absorptive capacity of a firm (Quintana-García and Benavides-Velasco, 2008; Phelps, 2010; Lin, 2011), which is the ability of firms to absorb, learn and use external knowledge (Cohen and Levinthal, 1990). As shown by Powell et al. (1996), firms with a higher level of absorptive capacity learn more from their collaborative activities.

The knowledge-based view of the firm also acknowledges the advantages of having access to a diverse set of knowledge. This perspective focuses on the fit between product domain and the knowledge domain of a firm (Grant, 1997). Most knowledge is subject to economies of scale, i.e. low replication costs of knowledge, and economies of scope, i.e. a specific piece of knowledge can be used for the production of many products (Grant and Baden-Fuller, 2004). Strategic alliances provide access to the relevant knowledge for a specific product without the costs of owning the knowledge (Grant, 1996) and in this way optimize the economies of scope of knowledge.

Both organizational learning and the knowledge-based view acknowledge the benefits of access to a wide variety of knowledge, which will facilitate the creation of new patents in different types of technological domains. Moreover, the risk that existing capabilities are exhausted will be minimized and

prevent that firms only patent in familiar technological domains. Hence, we expect that access to a wide variety of knowledge, i.e. a diverse alliance portfolio, will positively influence firms' technological diversification, i.e. the number of technological fields in which a firm patents. Next, we will elaborate on the effects of the different dimensions of alliance portfolio diversity, and subsequently derive hypotheses.

#### **4.1 Alliance portfolio industry diversity**

Firms can form alliances with partners who are active in different industries. Collaborating with similar partners, i.e. from the same industry, reduces coordination costs and eases the transfer, assimilation and use of knowledge due to the overlap in prior related knowledge (Cohen and Levinthal, 1990, Lui and Ngo, 2005; Luo and Deng, 2009). However, if all alliance partners of a firm are similar, an additional alliance with a similar partner will not yield extra value for the development of innovations (Luo and Deng, 2009). Accessing similar capabilities and knowledge can cause problems of redundancy, in which new combinations of existing knowledge are exhausted (Vasudeva and Anand, 2011). Additionally, if a company only cooperates with similar partners, it is unlikely that it will explore new technological domains.

Collaboration with partners outside the industry of the focal firm reduces this problem by providing new knowledge, capabilities, trends, and practices (Vasudeva and Anand, 2011). This can accordingly be used to make novel associations and linkages with a firm's internal knowledge activities (Cohen and Levinthal, 1990; Lin, 2011). In addition, allying with firms that are already active in a particular industry, market entry to this new unfamiliar industry is facilitated by providing legitimacy (Eisenhardt and Schoonhoven, 1996; Duysters and Lokshin, 2011).

In conclusion, working with partners in the same industry (intra-industry alliances) contributes to patenting in familiar technology fields, while collaborating with partners outside your own industry (inter-industry alliances) facilitates the creation of patents in unfamiliar domains. A portfolio that consists of both intra- and inter-industry alliances, i.e. a diverse set of partners, will increase the variety of technology fields in which a firm patents, i.e. its technological diversification. This leads to the following hypothesis:

*H1: Alliance portfolio industry diversity increases firms' technological diversification.*

#### **4.2 Alliance portfolio functional diversity**

Firms can also form alliances in different stages in the value chain of a product (Rothaermel and Deeds, 2004; Jiang et al., 2010). These different stages require different types of searches for knowledge and therefore the formation of different types of alliances (Rothaermel and Deeds, 2004). In the early stages of product development, the exploration of new combinations of knowledge plays a central role, which advocates the use of R&D alliances (Jiang et al., 2010). These upstream alliances are usually formed with universities and other research institutes (Rothaermel and Deeds, 2006). In later stages, where the focus shifts to the exploitation of the created innovation, firms will employ marketing, manufacturing and distribution alliances (Jiang et al., 2010). These alliances are also called downstream alliances (Hess and Rothaermel, 2011). The above standing studies indicate that exploration alliances are formed with different types of partners than in case of exploitation alliances. For instance, in the pharmaceutical industry, exploration alliances will mostly be formed with biotechnology firms, whereas exploitation alliances are usually formed with large pharmaceutical companies (Rothaermel and Deeds, 2004). Moreover, Chesbrough (2003) states that many firms concentrate on one of the three types of activities, namely funding, generating or commercializing innovations.

According to Rothaermel and Deeds (2004), most firms conduct exploration and exploitation activities simultaneously, because they manage a number of concurrent projects, which are at different stages in the product development process, at the same time. In addition, March (1991) states that finding a balance between exploration and exploitation activities is essential for the continuation of firms. This indicates that firms forming alliances with different functional purposes during the different stages of the value chain have access to a wide variety of external knowledge. This access facilitates the development of new linkages and combinations, which can accordingly increase the number of technological fields in which a firm patents.

Concluding, balancing exploration and exploitation activities can increase the technological competences of firm by simultaneously exploiting familiar technological domains and exploring unfamiliar technological domains. Accordingly, firms can apply for patents in different stages of the value chain, resulting in an increase in the technological diversification of firms. Therefore, the following hypothesis is stated:

*H2: Alliance portfolio functional diversity increases firms' technological diversification.*

### 4.3 Alliance portfolio geographical diversity

Finally, firms can form alliances with companies located in different countries across the world. This dimension becomes increasingly relevant, as technological knowledge is more and more dispersed over the world (Archibugi and Iammarino, 2002; Duysters and Lokshin, 2011). Moreover, Inkpen (1998) argues that international strategic alliances can create unique learning opportunities for firms by providing access to different skills, knowledge bases and organizational cultures. The creation of new knowledge due to the exposure to new contexts is also supported by the organizational learning theory.

Rosenkopf and Almeida (2003) state that many firms still only search locally for new knowledge, while distant contexts offer new insights, and therefore facilitate the recombination of knowledge. They argue that alliances and the mobility of investors are useful mechanisms for firms to conduct a more global search for knowledge. In addition, collaborating with foreign partners can provide access to specialized technological expertise, which is not available locally (Duysters and Lokshin, 2011). Because the knowledge from international partners is less available, it is also more valuable than knowledge acquired from domestic alliances (Zhang et al., 2010).

Hence, we argue that if a firm allies with partners from different regions across the world, it has better access to new and specialized knowledge compared to companies that only cooperate locally. This broader access to knowledge facilitates the development of new ideas and subsequently the creation of unfamiliar patents. Moreover, we expect that these firms are able to patent in a wider variety of technological classes. This leads to the following hypothesis:

*H3: Alliance portfolio geographical diversity increases firms' technological diversification.*

## 5 Methodology

To test the hypotheses, a panel dataset has been constructed containing the alliance portfolios and patent portfolios of 43 pharmaceutical firms for a time period of eight years (1995 – 2002). These firms have been selected from the '2004 EU Industrial R&D Investment Scoreboard' as the top R&D spending pharmaceutical firms.

The pharmaceutical industry has been the focus of many studies in the field of open innovation, because of its high level of inter-firm collaborations (Hagedoorn, 2002). Whereas the existing literature on the effect of alliance portfolio diversity tests its impact on the number of patents, this current study propose the use of an alternative dependent variable, namely technological diversification, which is measured as the diversity of firms' applied patents. Therefore, the focus on pharmaceutical firms allows us to compare our findings with the existing literature.

To construct the alliance portfolios, we used the Thomson SDC Platinum database. This database is based on press releases in which new alliances are announced. For each of the 43 pharmaceutical firms, we downloaded all announcements for the selected years. Next, the downloaded text files were transformed to an Excel-format, after which they were imported and merged in the software program STATA.

Several modifications had to be done to make the dataset usable. The original dataset consisted both of alliance-level variables and firm-level variables. The former were only listed for one of the partners in the alliance and therefore had to be duplicated for the other partner(s). Moreover, some variables were coded as strings, e.g. 'Yes' or 'No'. These variables were recoded in numerical values in order to be able to include them in regression analyses. Moreover, we analyzed whether the names of the companies were consistent and adjusted them if necessary.

Next, we coded the characteristics of each alliance into different categories, which were subsequently used to create the different diversity measures. This coding process will be discussed in more detail in one of the next paragraphs. Subsequently, the number of alliances per category was counted for each of the firms in the dataset. In this way, a firm-level dataset was created, namely the frequency of each category per year was listed for each of the firms. Accordingly, we aggregated the totals of the previous four years to the totals of a focal year, assuming that an alliance between two partners on average lasts five years before it ends. A time-window of five years is a common assumption according to Sampson (2007). The relative size of each category was then calculated as the size of a specific category divided by the total number of alliances of the last five years. These ratios were used to calculate the Blau Index of Variability, which is frequently used to measure diversity. This index will be described in more depth in the next paragraph.

Finally, if a company resulted from a large merger after 1995, it was only included in the sample after its foundation, which makes the dataset slightly unbalanced<sup>1</sup>. In total, the data set contains 294 firm-year observations.

### 5.1 Dependent variable

In line with prior research (Leten et al., 2007; Quintana-García and Benavides-Velasco, 2008), as can also be seen in table 2, we measure technological diversification of firms as the variety of technological classes in which a firm has applied for a patent in a particular year. The patent data is collected from the European Patent Office (EPO). Each granted patent is assigned at least to one of the IPC (International Patent Classification) classes. For our diversification measure, a distinction is made between 625 different 4-digit IPC classes.

Based on this classification, a variation of the Herfindahl index is used to construct the dependent variable, namely the Blau Index of Variability (Blau, 1977). According to Quintana-García and Benavides-Velasco (2008) and Leten et al. (2007), the Blau Index has been widely used to measure the heterogeneity of categorical variables. The Index can be calculated as follows:  $D = 1 - \sum p_i^2$ , where  $D$  is the degree of diversity,  $p$  is the proportion belonging to given category (i.e. IPC class), and  $i$  is the number of total number of categories in which a firm patents. The range of the dependent variable is between 0 and 1, where 0 represents zero technological diversification and 1 indicates a fully balanced patent portfolio in which patents are equally distributed across the classes in which a firm patents.

### 5.2 Independent variables

As argued in this paper, alliance portfolio diversity can be measured in different ways. We focus on three different dimensions, namely alliance portfolio industry diversity, alliance portfolio functional diversity and alliance portfolio geographical diversity. As a first step, the characteristics of each alliance were coded into different categories. Next, we will discuss which categories were used to construct the three diversity measures.

First, *alliance portfolio industry diversity* focuses on the overlap in the four-digit SIC codes of the focus firm and its partner(s) in a particular alliance (Keil et al., 2008). In this way, alliance portfolio industry diversity represents the variety of operational alliances in terms of industry relatedness. An alliance was coded as '0', when the SIC codes were unrelated; as '1', when they shared the same one- or two-digit SIC code indicating a related industry; and finally, as '2', when an alliance was formed between partners with the same three- or four-digit SIC codes referring to an intra-industry alliance.

Second, *alliance portfolio functional diversity* concentrates on the variety of operational alliances in terms of functional activities. While Jiang et al. (2010) code functional activities as R&D, marketing, manufacturing or other type of alliances, we argue that this categorization is too broad. Following the existing literature, we distinguish between explorative and exploitative purposes. The functional activity of an alliance is coded as follows: '1' for R&D alliances, indicating explorative activities, and '2' for manufacturing, marketing and other type of alliances<sup>2</sup>, indicating exploitative activities.

At last, *alliance portfolio geographical diversity* represents the variety of operational alliances in terms of geographical coverage. Geographical diversity was defined as the overlap in the world regions in which the focal firm and its partner(s) were located. Each partner firm was coded based on its location in one of the six categories: '1' for North America, '2' for South America, '3' for Africa, '4' for Europe, '5' for Asia, and '6' for Australia.

Likewise, the Blau Index of Variability was used to construct the three portfolio diversity measures. To clarify, we provide a brief example how we calculated this index for one of these dimensions. In our example, firm A has an alliance portfolio that consists of 20 partners, namely 4 North American, 3 South American, 1 African, 8 European, 2 Asian and 2 Australian partners. By squaring the proportions of each of the six categories, the Blau index is calculated as follows:

$$D = 1 - \sum p_i^2 = 1 - [(4/20)^2 + (3/20)^2 + (1/20)^2 + (8/20)^2 + (2/20)^2 + (2/20)^2] = 0,795.$$

A value close to zero represents a low level of diversity, whereas a higher value indicates that a firm's alliance portfolio is more balanced with equal proportions for each category.

In addition, squared terms of each dimension of alliance portfolio diversity were created. The existing literature that examines the impact of alliance portfolio diversity on the number of patents finds an inverted U-shape relation, indicating that firms face a certain cognitive limit that constrains learning

<sup>1</sup> The following firms resulted from a larger merger after 1995 and were included in the dataset after their foundation (founding year): AstraZeneca (1999), Aventis (1999), Glaxo Smith Kline (2000), Mitsubishi Pharma (1998), Novartis (1996) and Sanofi (2000).

<sup>2</sup> The category 'other type of alliances' includes exploration, funding, supply and (exclusive) licensing agreements.

and the transfer of knowledge (Levitt and March, 1988; Cohen and Levinthal, 1990; Levinthal and March, 1993; Grant, 1996; Grant and Baden-Fuller, 2004). By adding squared terms, we are able to investigate whether the hypothesized relationships are non-linear or marginally increasing rather than linear.

### 5.3 Control variables

Next to the independent variables, a number of control variables have been included to account for other firm-level factors that impact the technological diversification of firms. First, we control for the R&D intensity of firms. Firms with a higher level of expenditures on R&D are expected to face fewer restrictions in the choice of innovation projects and therefore to have a more balanced set of innovation activities. This measure is calculated by dividing the R&D expenditures (in millions of US dollars) by the sales of the firm (in millions of US dollars).

Second, some firms differ have experience in conducting R&D activities than others. This can be seen as the variations in the return on R&D or the efficiency of converting R&D efforts into patents. Hence, we control for these differences by including the patent propensity. This is measured by dividing the number of patent applications that a firm received in particular year by its R&D expenditures in that year.

Third, we control for the alliance experience of firms. Existing literature (e.g. Sivakumar et al., 2011) shows that companies with more experience in managing past alliances have a higher innovation performance. Alliance experience is measured as a logarithm of the number of operational alliances.

In addition, the larger a firm is, the higher its innovation performance (Rothaermel and Deeds, 2004, Luo and Deng, 2009, Sivakumar et al., 2011). Duysters and Lokshin (2011) argue that larger firms have more resources available for the management of alliance portfolios in comparison to smaller firms, which often face financial and managerial constraints (Duysters and Lokshin, 2011). We control for this by including an indicator for firm size, namely a logarithm of the number of employees. The data on R&D expenditures, sales, and employees is gathered from corporate annual reports and financial databases (i.e. Worldscope and Compustat).

Finally, time dummies are included to account for time-varying effects that are related to firms' technological diversification, but are identical for all firms in the sample. These could, for instance, be industry-related or macroeconomic effects. The year 1995, the first year in the sample, is used as the reference category.

### 5.4 Analytical method

For this study, we constructed a panel dataset to test whether alliance portfolio diversity alters the technological diversification of firms. Next, we need to decide how to treat the unobserved individual effects, which are present in panel data. Fixed effects regression assumes that the explanatory variables are related to these unobserved individual effects. Moreover, this method aims to identify differences within groups. The random effects regression, on the other hand, assumes that there is no relation between the explanatory variables and the unobserved individual effects. Because the dataset contains repeated observations for the same groups (i.e. firms), this assumption is not likely to hold. A Hausman test has been conducted to test whether the fixed effects estimators and random effects estimators were systematically different. The test statistic advocates the use of the fixed effects method to estimate our proposed models (Model 8  $X_{15}^2 = 36.56, p = 0.0015$ ). In addition, the fixed effects regression results provide significant evidence of a correlation between the explanatory variables and the unobserved individual effects ( $F = 7.31, p = 0.0000$ ).

## 6 Empirical Results

Table 3 presents the descriptive statistics and correlations. The technological diversification of firms slightly increased over time, as the average value was 0.7882 in 1995 and 0.7939 in 2002. Also the average number of applied patents increased from 55 per year (in 1995) to 90 per year (in 2002). The sample consisted of large firms with on average 28174 employees, annual sales of \$9088796 million and spending \$1133632 million on R&D (in 2002). Additionally, table 3 shows that the alliance portfolios of the selected pharmaceutical firms were quite diverse for each of the dimensions.

Table 3 also provides correlations between the dependent, independent and control variables. In general, the correlations between the independent and control variables are rather low. The correlation between the logarithm of the number of employees and the logarithm of the number of operational alliances is relatively high. This finding indicates that firms that are larger in size also have more alliances, which seems plausible. Moreover, the VIF measures are all below a value of 4 suggesting that

multicollinearity of the variables is not a problem in our analyses. We also tested whether our main independent variables were endogenous, i.e. whether technological diversification also affects the alliance portfolio diversity of firms. However, we did not find evidence of endogeneity for each of the three dimensions<sup>1</sup>.

**Table 3 Descriptive Statistics and Correlations**

Variables	Mean	SD	1	2	3	4	5	6	7
1 Technological Diversification	0.7824	0.1069							
2 Patent Propensity	0.0124	0.0142	0.2520						
3 Log (Employees)	9.2549	1.4366	0.6118	0.0226					
4 Log (Alliances)	2.6779	1.0216	0.4835	0.0139	0.7824				
5 R&D Intensity	0.1777	0.4350	-0.1598	0.0607	-0.3402	0.0109			
6 Industry Diversity	0.4263	0.2067	0.3553	0.0864	0.3812	0.4448	-0.1434		
7 Functional Diversity	0.3705	0.1290	0.3247	-0.0099	0.2961	0.4294	0.1174	0.3356	
8 Geographical Diversity	0.4670	0.1694	0.2472	0.1010	0.2147	0.2631	-0.1019	0.4279	0.4031

The results of the fixed effects regression analyses are provided in table 4. Model 1 is the baseline model by including only the control variables. The number of operational alliances has a positive, significant effect on the technological diversification of firms ( $p < 0.10$ ). For the other control variables we did not find any significant results. The linear terms of industry, functional and geographical diversity are added in Model 2, 4 and 6 respectively. Subsequently, the squared terms were added in model 3, 5 and 7. Finally, we jointly test the effects of the three dimensions of alliance portfolio diversity in model 8.

Hypothesis 1 predicted a positive relation between alliance portfolio industry diversity and technological diversification, which will be analyzed based on the results of model 2 and model 3. Model 2 shows a positive and significant root term for industry diversity ( $p = 0.074$ ), providing support for hypothesis 1. Further analyses were conducted to analyze the existence of a non-linear relationship. The result of a joint F-test of the root and the squared terms in model 3 is insignificant ( $p = 0.1925$ ). Additionally, a more formal ‘utest’ was conducted, developed by Lind and Mehlum (2010). This test evaluates whether the relationship is U-shaped or inverted U-shaped by determining whether the inflection point is between the minimum and the maximum value of the explanatory variable. The results of this test show that the extreme point is outside the interval, indicating that the relation between alliance portfolio industry diversity is linear and positive. Hence, we accept hypothesis 1.

Alliance portfolio functional diversity was also predicted to have a positive impact on technological diversification as stated in hypothesis 2. Model 4 shows a negative coefficient for functional diversity, however it is marginally insignificant ( $p = 0.1052$ ). Subsequently, a squared term is added in model 5. The root and the squared terms are jointly significant ( $p = 0.022$ ). The negative coefficient of the root term and the positive coefficient of the squared term indicate the presence of a U-shaped relation. The ‘utest’ of Lind and Mehlum (2010) provides a test value of 1.39, which is significant at the 10% level ( $p = 0.0828$ ). Concluding, because the findings show a U-shaped relation between alliance portfolio functional diversity and technological diversification, we fail to accept hypothesis 2.

<sup>1</sup> We conducted several Hausman tests in order to investigate whether our three main independent variables were endogenous. Under the null hypothesis, the coefficients from the OLS and the IV regression are similar. The alternative hypothesis states that only the IV estimators are consistent. As an instrument for ‘industry diversity’, we used the other two dimensions (functional and geographical diversity). The approach for the other two dimensions was the same. The results show that industry diversity (Model 2  $X_{13}^2 = 17.98$ ,  $p = 0.1583$ ), functional diversity (Model 4  $X_{13}^2 = 1.33$ ,  $p = 1.0000$ ), and geographical diversity (Model 6  $X_{13}^2 = 1.06$ ,  $p = 1.0000$ ) are not statistically significant, and therefore not endogenous.

**Table 4 Regression Analyses<sup>1</sup>**

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Patent Propensity	0.221 (0.659)	0.333 (0.659)	0.300 (0.668)	0.176 (0.657)	0.352 (0.656)	0.310 (0.660)	0.319 (0.668)	0.554 (0.657)
Logarithm of # Employees	0.020 (0.019)	0.022 (0.019)	0.022 (0.019)	0.017 (0.019)	0.023 (0.019)	0.018 (0.019)	0.018 (0.019)	0.025 (0.019)
Logarithm of # Alliances	0.026* (0.013)	0.016 (0.014)	0.016 (0.014)	0.036*** (0.015)	0.042*** (0.015)	0.035*** (0.015)	0.035*** (0.015)	0.035*** (0.015)
R&D Intensity	-0.013 (0.017)	-0.011 (0.017)	-0.011 (0.017)	-0.013 (0.017)	-0.014 (0.016)	-0.015 (0.017)	-0.015 (0.017)	-0.013 (0.015)
Industry Diversity		0.065* (0.036)	0.091 (0.089)					0.090** (0.037)
Industry Diversity Squared			-0.042 (0.133)					
Functional Diversity				-0.082 (0.051)	-0.374*** (0.139)			-0.382** (0.154)
Functional Diversity Squared					0.545** (0.242)			0.553** (0.260)
Geographical Diversity						-0.051 (0.035)	-0.042 (0.098)	-0.027 (0.040)
Geographical Diversity Squared							-0.013 (0.130)	
Intercept	0.511*** (0.177)	0.487*** (0.177)	0.491*** (0.178)	0.535*** (0.177)	0.488*** (0.177)	0.524*** (0.177)	0.525*** (0.178)	0.462*** (0.176)
Number of Observations	294	294	294	294	294	294	294	294
Number of Firms	43	43	43	43	43	43	43	43
Model F	2.376	2.468	2.277	2.414	2.658	2.362	2.172	2.736
R-Squared	0.098	0.110	0.111	0.108	0.127	0.106	0.106	0.148
Within	0.442	0.481	0.474	0.382	0.415	0.397	0.398	0.442
Between								
Overall	0.388	0.417	0.411	0.347	0.368	0.363	0.363	0.395

<sup>1</sup> Significance of the coefficients is indicated by \*(0.10), \*\* (0.05) and \*\*\* (0.01). Standard errors are between the parentheses. All models include firm and year fixed effects.

Hypothesis 3 predicted that alliance portfolio geographical diversity increases firms' technological diversification by providing access to knowledge across the world. The results in model 6 show an insignificant coefficient for the root term of geographical diversity ( $p = 0.150$ ). Adding a squared term in model 7 also provides insignificant results for the root and the squared term of geographical diversity. A joint F-test of the two terms is also insignificant ( $p = 0.3542$ ) as well as the 'utest'. Hence, our results do not provide statistical support for hypothesis 3.

Finally, we estimate the joint effect of the three dimensions of alliance portfolio diversity. Based on the previous findings, we include, next to the root terms of industry, functional and geographical diversity, a squared term for functional diversity in model 8. The joint F-test is highly significant ( $p = 0.0091$ ). This finding shows that alliance portfolio diversity influences the technological diversification of firms. Because we found diverging results for the effects of the different dimensions, we cannot infer anything about the nature of the relationship between both constructs.

When looking at the individual results of the three dimensions in model 8, we observe that their significance levels have changed. Industry diversity has a stronger, positive effect on technological diversification ( $p = 0.016$ ) as well as the U-shaped effect of functional diversity ( $p = 0.040$ ). The relation between geographical diversity and technological diversification remains insignificant ( $p = 0.498$ ). A further discussion of our results and their implications will be provided below.

## 7 Conclusion

While the existing literature has focused on the impact alliance portfolio diversification on technological performance, i.e. the number of patent applications, research examining its impact on the technological diversification of firms, i.e. the variety of patent applications, is lacking. Therefore, the aim of this study was to explore the relationship between alliance portfolio diversity and the technological diversification of firms. Based on the organizational learning theory and the knowledge-based view of the firm, we hypothesized a positive relation by arguing that the access to a wide variety of knowledge would facilitate patenting in diverse set of technological fields. Our empirical analyses focused on the largest firms in the pharmaceutical industry and showed that the relationship between alliance portfolio diversity and technological diversification is more complex than hypothesized. While our findings provide support that alliance portfolio diversity significantly influences firms' technological diversification, the nature of this relationship varies between the three dimensions of alliance portfolio diversity.

First of all, a positive, significant effect is found for alliance portfolio industry diversity, indicating that collaborating with partners from a diverse set of industries facilitates the creation of new linkages and associations (Vasudeva and Anand, 2011), and accordingly provides firms the opportunity to patent in new technological domains. In addition, no evidence was found of the negative effects of high level of industry diversity. This finding suggests that pharmaceutical companies should both form intra- and inter-industry alliances in order to increase their technological diversification.

Second, alliance portfolio functional diversity was found to have a U-shaped effect on technological diversification. This finding implies that pharmaceutical firms with a low or high level of functional diversity in their alliance portfolio have a higher level of technological diversification than firms with a moderate level of diversity. In accordance with the existing literature (e.g. March, 1991; Rothaermel and Deeds, 2004), which states that balancing exploration and exploitation activities benefits the innovation performance of firms, our results show that collaborating on a wide variety of functional purposes increases the variety of technological classes in which a firm patents. On the other hand, pharmaceutical firms that concentrate on forming alliances with a particular purpose, i.e. only explorative or exploitative alliances, are also found to be successful in terms of technological diversification. We conducted some further analyses to examine in which activities these companies specialize. The results show that 21 observations have a fully focused alliance portfolio in terms of functional diversity, of which 18 focus on exploitative alliances and 3 observations focus on explorative alliances. A t-test is conducted to test which approach yields a higher level of technological diversification. However, this test does not provide significant results. Still, we observe that some firms apparently are able to be successful in terms of technological diversification while only conducting exploitative alliances. Because firms increasingly concentrate on a particular type of functional activity, as argued by Chesbrough (2003), some firms might decide to conduct their explorative activities in-house, while collaborating on exploitative activities. This might allow firms to concentrate their alliance activities, while being able to patent in a variety of technological fields. However, this statement



has not been studied so far, and might be an interesting avenue for future research. Overall, if a pharmaceutical company wants to increase its technological diversification, an intermediate level of functional diversity is found to be the least successful.

Third, our study did not find a significant relation between geographical diversity and technological diversification. Although the literature states that knowledge is more and more dispersed over the world (Duysters and Lokshin, 2011), which would advocate the formation of alliances with partners in different world regions to be able to access this information, we did not find support for this statement. This is an interesting result, because this might indicate that the same knowledge is available everywhere (in the pharmaceutical industry) or that the location of an alliance partner does not matter. Future research could examine this finding in more depth in order to analyze whether this insignificant relation also holds in other industries.

The findings of our study contribute to the existing alliance portfolio research by empirically demonstrating that alliance portfolio diversity does not only influences the *size* of firms' patent portfolios (Leten et al., 2007; Guintana-García and Benavides-Velasco, 2008; Phelps, 2010), but also has a substantial impact on the *composition* of the patent portfolio. Accordingly, this can improve the financial and innovation performance of firms (Antonelli and Calderini, 2008; Belderbos et al., 2010; Chen and Chang, 2010). Moreover, the existing research finds an inverted U-shape between alliance portfolio diversity and the size of a technology portfolio, indicating that the effect of alliance portfolio diversity becomes negative after a certain threshold is reached. Our results, on the other hand, do not find negative effects at a high level of diversity and therefore clearly show the benefits of creating of a highly diverse alliance portfolio. This indicates that it is important to distinguish between the effect on the size and the composition firms' patent portfolios.

Furthermore, as advocated by the organizational learning theory and the knowledge-based view of the view (Cohen and Levinthal, 1990; George et al., 2001; Grant, 1996; Lin, 2011), our study acknowledges the importance of being able to access a diverse set of knowledge for the development of *new* knowledge and innovations. As a new contribution to the existing literature, this study shows that access to a variety of knowledge also *broadens* the scope of the knowledge developed by the firm. This indicates that firms can rely on alliance portfolios as a strategic tool to diversify their technological portfolio.

Besides, only recently, studies have started to operationalize alliance portfolio diversity as a multi-dimensional construct, e.g. Jiang et al. (2010). Our results confirm that diversity is not a single dimensional construct by showing that three dimensions of alliance portfolio diversity have a differential impact on the technological diversification of firms. Hence, this study aims to contribute to this new development of analyzing the effects of alliance portfolio diversity in more depth.

Our study also has practical implications. Managers should realize that the decision to enter a particular alliance affects the technological diversification of their firms. Firms could also influence their technological diversification by forming different types of alliances. This is important, because the existing literature indicates that technological diversification increases the innovative and financial capabilities of firms. On the other hand, it is important to notice that although managers have an influence, they face important trade-offs in deciding with whom to form an alliance and for which purpose. The results of this study suggest that it is important for firms to map their alliance portfolio to increase their ability to evaluate the added value of a potential alliance to the portfolio. In this way, managers can analyze how this potential addition changes the diversity of their alliance portfolio, which can accordingly impact the technological diversification of their firm.

For policymakers it is important as well to realize that they can increase the innovative capabilities of their country by stimulating the collaboration within and between industries. For instance, the Dutch government has developed a new policy program in order to become one of the top 5 knowledge economies in the world. To achieve this goal, 9 'top sectors' have been identified, in which governments, companies, university and research institutes agreed to collaborate. However, this program mainly focuses on the collaboration *within* industries, while the results of our research also stress the importance of collaborating *between* industries. This is an issue that needs attention from the Dutch government if they want achieve their goal.

This study knows several limitations. First of all, our empirical analyses concentrated on the pharmaceutical industry. Although the existing alliance portfolio research largely focused on this industry, it might be interesting to examine other industries as well. This will allow us to identify differences and similarities across industries. Furthermore, the 43 largest firms in terms of R&D expenditures were selected. A future study could extend this sample by also including smaller firms,

which would provide a more complete overview of this industry. A third concern is the time frame of eight years, which could be extended in future studies.

Moreover, it might be interesting to further explore the relationship between alliance portfolio diversity, technological diversification and technological performance. Technological diversification could, for instance, act as a moderator or mediator. Secondly, future studies could examine the type of knowledge, i.e. tacit or explicit, that is transferred between the different partners. In this way, we might identify which type of knowledge is most valuable to increase the technological diversification of firms. Finally, although this study combined several theoretical perspectives, a clear theoretical framework in this field of research is missing. Future research should therefore aim to strengthen the theoretical underpinnings of alliance portfolio research.

In sum, while the existing literature focused on the technological performance of firms, this study aimed to fill a gap in the literature by examining the impact of alliance portfolio diversity and firms' technological diversification. Our results showed a significant relationship, however, it is found to be more complex than hypothesized. By making an explicit distinction between different dimensions of alliance portfolio diversity, we showed that alliance portfolio industry diversity, alliance portfolio functional diversity, and alliance portfolio geographical diversity have a differential impact on technological diversification. Jointly, these findings indicate that alliance portfolios can be used as a strategic tool to diversify firms' technological capabilities.

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# Research on the Operating Evaluation Index System of Industry Technology Innovation Strategic Alliance

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**Abstract:** Promote industrial technology innovation strategy alliance construction is one of important national strategic measures. To construct industry technology innovation strategic alliance is a strategy idea for region to transform resources into the development conditions, and also a breakthrough way to develop and restructure industry. This study aims at build an operating evaluation<sup>1</sup> index system for industrial technology innovation strategy alliance. Try to conclude the inadequacies and barriers from the current situation.

**Key words:** Industry technology innovation strategic alliance; Strategy alliance; Evaluation index system; AHP

## 1 Introduction

Promote industrial technology innovation strategy alliance construction, as the important one from series of national strategic measures, which is implemented by the national ministry of science and technology, the ministry of finance, the ministry of education, China development Bank and so on six ministries and commissions in order to carry out the national technical innovation, intensify the combination and promote technology innovation system construction. To construct industry technology innovation strategic alliance is not only a strategy idea for region to take science and technology resources which could transform into the economic and social development, but also a breakthrough way to strengthen industrial core competitiveness, promote the readjustment of the economic structure and development mode. Moreover, it's an effective way to put enterprise technology innovation in main status, promote industry-university-institute innovation and regional innovation system. Since 2009, Hubei province has had started its industry technology innovation strategy alliance construction from experimental units, now there were 21 alliances. Three alliances including Fiber To The Building (FTTx), geographic information system (GIS) and rapeseed processing industry technology innovation alliances are replied as the national experimental alliances by Ministry of Science and Technology. In the preliminary period Hubei province had got many achievements especially on technology innovation, but there are also some operating and managing problems which focus on public strategies and enterprise member's relationship mechanism.

According to the government investigation project of industrial technology innovation strategy alliance development from Hubei province in 2011, this study aims at build an operating evaluation index system for industrial technology innovation strategy alliance. Try to further and comprehensively analyze the related factors in operating and management process, then conclude the inadequacies and barriers from the current situation.

## 2 Literature Review

The concept of strategic alliance was firstly put forward by the CEO of DEC Company J. Hopland and managerialist R. Nigel, after that this idea was concerned greatly by academia and enterprises. Different scholars give different definitions in their own theoretical perspectives; the theories of strategic alliance are gradually more abundant than before. Early theories mainly contain the theory of labor division professionalization, transaction cost, Value Chain and so on. From Adam Smith's theory, the levels of division include enterprises inside division, between enterprises division and industries division. Essentially between enterprises division is the theory basis of strategic alliance. Because of this kind of division, strategic alliance has the effective advantages which aren't had enough by single enterprise or the whole market. Strategy alliance ensures the efficiency mechanism of division and professionalization so that the relationship of division and cooperation could expand and deepen in bigger ranges.

For technology alliance, J. Hopland and R. Nigel though that enterprise alliance is two or more

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<sup>1</sup> From the project: Soft Science Project of Science and Technology Agency of Hubei Province 20112s0129

than two Equivalence economic entities, for a common strategic goal, form together as the shared interests and risks loose network organization, such as primary theory Trust and Konzern, and nowadays Joint Venture Enterprise and Franchisees. As the views of Yoshino and Rangan(1995), two types of cross organization joint rule out of the definition of cross organizations cooperation technology innovation, one is the capital cooperative joint, another is the traditional contract, for example short-term contract, franchise rights, license and interactive license, etc.

Industry technology innovation strategic alliance is a new organization form of technology innovation that is practiced and explored from our industry-university-institute cooperation. Industrial technology innovation strategic alliance is organized by enterprises, universities, scientific research institutions or other organizations to joint development, complementary advantages and shared interests and risks which based on the demand of enterprise development and the all parts common interests, the goal is to improve the industrial technology innovation ability and the binding contract for security. Industry technology innovation strategic alliance essentially is an advanced form of industry-university-institute cooperation, which could satisfy the demands from enterprises, universities and institutes, the capital and research force are mobilized together by every member of the cooperation alliance, and they are stabled by the contracts. It is a kind of entity which is driven under the common value orientation and every part should start from its own role in the cooperation and work hard in order to realize the common value. For the organization mode, most of scholars studying strategic technology alliance structure prefer to divide strategic technology alliance into two parts: equity alliances and non-equity alliances. For the operating mechanism, industry technology innovation strategic alliance is a kind of contractual relationship; the alliance doesn't have the independent legal person status, but current law could standard its behavior completely.

In recent years, there are many researches from the domestic scholars that focus on evaluation of industrial technology innovation strategic alliance. Huang Ziyun (2010) according to the purpose and principles of industry-university-institute innovation alliance, make a value judgment for the direct and indirect economic effect and the development of self competitive ability, then build an alliance evaluation index system. For the operating performance evaluation, Zhang Haijun (2008) build a index system for logistics alliance, it contains inside and outside parts, and cooperation relation part, then use the Fuzzy mathematics method and Benchmarking principle method to get the final evaluatio. Wan Pingnan and Liu Hongxia research the industry alliance performance through considering the environment and organization factors.

### **3 Operating Evaluation Index System for Industrial Technology Innovation Strategic Alliance**

#### **3.1 Design of the evaluation index system**

According to the past literatures, we got some important evaluation factors, then use the key variables to do the questionnaires. In order to constructing industry technology innovation strategy alliance evaluation system, we also use other useful information as the important basis after taking part in the symposium of industry technical innovation strategy alliance in Hubei province. From this symposium we further understand and analysis of the advantages and disadvantages, the present development situation. Then we analyze two parts of the system, the one is about the alliance Operation management, another is about Cooperation relationship. In order to facilitate the weight distribution and evaluation, we analyze the Operation management in 7 parts as the first level factor (F1a): policy environment, marketing environment, investment and finance, alliance purpose, interest distribution, risk prevention and operating ability. Based on the first level factor we further analyze them in 13 factors as the second level factor (F2a). And we also analyze the Cooperation relationship in 5 parts as the first level factor (F2a): adequacy of Communication, coordination degree of Intellectual property rights, the trust degree between members, willing and motivation and suitability of partner selection. Based on them we further analyze in 12 factors as well. In the questionnaire design, we take the Likert scale of five rating index method to get each score.

#### **3.2 Determination of the index weight**

For determining the value of the weight of every evaluation factors, we mainly use the Analytic Hierarchy Process (AHP). Firstly we constructed the first and second level factors pair wise comparison matrixes, which could compare the relative importance between i factor or j factor and the other layer factors as the described way of quantitative relative weight  $a_{ij}$ . The value of  $a_{ij}$  in pair wise comparison matrixes is accorded with Satty's suggestion as following scales:  $a_{ij} = 1$ , i and j have the same relative

importance with the above level factors;  $a_{ij} = 3$ ,  $i$  is little more important than  $j$ ;  $a_{ij} = 5$ ,  $i$  is more important than  $j$ ;  $a_{ij} = 7$ ,  $i$  is really more important than  $j$ ;  $a_{ij} = 9$ ,  $i$  is extremely more important than  $j$ ;  $a_{ij} = 2n$ ,  $n=1,2,3,4$ , the importance of  $i$  and  $j$  are between  $a_{ij} = 2n-1$  and  $a_{ij} = 2n+1$ ;  $a_{ij} = 1/n$ ,  $n=1,2,3 \dots 9$ .

For example, according with the Delphi method, we can firstly get the first level factors pair wise comparison matrixes of the whole operation management (Policy environment  $x_1$ , Marketing environment  $x_2$ , Investment and finance  $x_3$ , Alliance purpose  $x_4$ , Operating ability  $x_5$ , Interest distribution  $x_6$ , Risk prevention  $x_7$ ):

$$\begin{pmatrix} 1 & \frac{1}{2} & \frac{1}{4} & \frac{1}{5} & \frac{1}{8} & \frac{1}{7} & \frac{1}{4} \\ 2 & 1 & \frac{1}{2} & \frac{2}{5} & \frac{1}{4} & \frac{2}{7} & \frac{1}{2} \\ 4 & 2 & 1 & \frac{4}{5} & \frac{1}{2} & \frac{4}{7} & 1 \\ 5 & \frac{5}{2} & \frac{5}{4} & 1 & \frac{5}{8} & \frac{5}{7} & \frac{5}{4} \\ 8 & 4 & 2 & \frac{8}{5} & 1 & \frac{8}{7} & 2 \\ 7 & \frac{7}{2} & \frac{7}{4} & \frac{7}{5} & \frac{7}{8} & 1 & \frac{7}{4} \\ 4 & 2 & 1 & \frac{4}{5} & \frac{1}{2} & \frac{4}{7} & 1 \end{pmatrix}$$

RI=1.32, CR =0.092<0.1, that is through the consistency check.  
Weight vectors are (0.062, 0.065, 0.129, 0.161, 0.258, 0.226, 0.129)

After we get the first level factor weight values, then we can confirm the relative second level factor weight. Because the second level pair wise comparison matrixes of marketing environment is  $\begin{bmatrix} 1 & 1 \\ 0.5 & 0.5 \end{bmatrix}$ , the degree of competition and the degree of demand in marketing environment have same weight values: 0.5, 0.5. By parity of reasoning, we can definite all weight values of each factors. (See table 1).

### 4 Analysis of the Experimental Result

In the investigation part we focus on the participating Hubei province enterprises of alliances, scientific research institutes and administration organizations as the targets. We distribute 182 questionnaires via alliance secretariat channels. 124 effective questionnaires could be the final statistic data. Hubei enterprises are 78.9% of the total, institutes and administration organizations are 21.1%. Weight values are showed in the parenthesis beside each factor; the final result of this investigation is showed by following table 1; (Keep three-digit number after decimal point):

**Table 1 The Score of Alliance Operation Management and Cooperation Relationship evaluation**

	Total score	The first level factor (F1a/F1b)	Weighted average score	The second level factor (F2a/F2b)	Score
Operation Management	1.839	Policy environment (0.062)	2.725	Degree of policy support (0.5)	2.725
		Marketing environment (0.065)	4.313	Degree of competition (0.5)	3.875
				Degree of demand (0.5)	4.750
		Investment and finance (0.129)	2.125	Investment environment & channel	2.125
		Alliance purpose (0.161)	3.835	Determinacy (0.67)	3.975
				Compatibility (0.33)	3.550
		Interest distribution (0.226)	3.635	Fairness (0.6)	3.975
				Rationality (0.4)	3.125
		Risk prevention (0.129)	1.585	Systematize risk prevention (0.56)	1.750
				Executive force of risk control(0.44)	1.375
Operating ability (0.258)	3.451	Appropriate structure (0.18)	3.765		
		Rationality of operating (0.27)	3.500		
		Implementation of administration (0.55)	3.325		

Cooperation Relationship	4.080	Adequacy of Communication (0.286)	3.596	Communication quality (0.57)	3.250
				Degree of information sharing (0.29)	3.995
				Participation of goal setting (0.14)	4.175
		Coordination degree of Intellectual property rights (0.190)	3.940	The distribution of IPR(0.67)	3.800
				The maintenance of IPR (0.33)	4.225
		The trust degree between members (0.381)	4.220	Participate cooperation process (0.44)	4.500
				Share scientific and technological achievements (0.56)	4.000
		Willing and motivation (0.095)	4.875	Willing and motivation	4.875
		Suitability of partner selection (0.048)	3.716	Enterprises complementary (0.14)	3.365
				Enterprises similarity (0.14)	3.675
				Reputation of enterprises (0.29)	4.225
				Ability of enterprise (0.43)	3.500

According to the above comprehensive evaluation scores, Hubei province industrial technology innovation strategic alliance operation administration just get the total score 1.839, the lower parts mainly focus on policy support (2.725), investment and financing mechanism (2.125) and risk prevention (1.585). Therefore, we can find that union or enterprise members of alliances aren't satisfied with the current alliance operation. From the actual interview of these enterprises, we think that three aspects cause the fact: the government financial support is insufficient, alliance operating budget is hard to rise, administration organization service is difficult to implement; in the primary period of alliance operation, it lacks of risk prevention mechanism. From the point of view of the cooperation relationships, Hubei province industrial technology innovation strategic alliance overall cooperation is in a good condition, in the scores of cooperation relationships index, most of scientific research institutions gave the higher scores generally (4.750), enterprises gave the lower scores (3.902) than others.

## 5 Conclusions

From two aspects of the operation management and cooperation relationship, the operation evaluation system can deeply reveals industry technology innovation alliance. The former part is the evaluation function and effect of operation factors and the latter one is the measure of the relationship development situation between participating subjects. The evaluation result provides the beneficial reference for government in the alliance operation when they exercise their rights and responsibilities, make specific strategy or measures and analyze the situations.

Through establishing the industrial technology innovation strategic alliance index system and the empirical research in Hubei province experimental alliance, we find out the current problems of them. Mainly focus on the government policy support is inadequate, financial support insufficiency, the alliance operation investment financing is difficult to occur, and lack of risk prevention mechanism and enterprise cooperation relations. For these reasons, alliance development need further guidance and implement of finance support, constructing a stable investment system and coordination support system and standard enter and exit mechanism of alliance enterprises. Promote great effect and development of industrial technology innovation strategy alliance.

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## Unpacking Incubation Elements and Management Practices

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**Abstract:** This paper follows upon a request for process oriented research that investigates incubation via an understanding of management practices and interactions. Going beyond other studies, this paper assesses affiliation with eight elements that underpin the commercialisation of tenant businesses, as recognized by Patton et al. The rationale behind this model is that intangible elements are the true contributors of value for tenants. By means of a multiple case study we conclude that, despite that the intended values are generally of importance, the articulation of the model is cumbersome and therefore not very useful to comprehend the incubation process. We divide their elements into three categories: 1) elements that respondents identify with, 2) elements that respondents do not identify with, and 3) elements that are cumbersome. To unpack the cumbersome elements we suggest alternative formulations, being an on-going tailor-made management advice and assistance and support with funding.

**Key words:** Incubation process; Unpacking incubation elements; Management practices

### 1 Introduction

Business Incubators (BIs) guide starting entrepreneurs through their development process and thereby constitute a strong instrument to promote innovation, entrepreneurship and economic growth<sup>[2, 11, 15, 21]</sup>. Because only few starting ventures make it through their early stages of development, the need to increase their population became a focus point for policy makers<sup>[6, 10, 21]</sup>, inducing a substantial increase in public and private spending on BIs<sup>[38, 41]</sup>. This led to a vast increase of the population of BIs, to an estimated worldwide population of 7.000 nowadays<sup>[34]</sup>.

BIs support new technology-based firms<sup>[3]</sup>, -denoted as tenants, for co-location often is prerequisite [6]-, that consist of entrepreneurial individuals or teams in the process of setting up their business<sup>[42]</sup>. Due to their technological backgrounds they often have limited experience of business and its context<sup>[37]</sup>. They lack the competencies and knowledge required to operate a business, such as knowledge about marketing, accounting, financial and human resources<sup>[10, 41, 47]</sup>. To overcome these liabilities, BI support services try to make tenants aware of their inexperience, facilitate their ability to acquire appropriate knowledge and help to integrate this knowledge into the business context<sup>[37]</sup>.

Rice<sup>[41]</sup> points to the importance of the relationship between the incubator manager and tenants and concludes that BI manager's skills in determining the timing and frequency of business support is crucial to the business development process<sup>[41, 52]</sup>. Each tenant is likely to require a different mix of support components, for individual needs will vary from tenant to tenant depending on the configuration of factors such as their experience base<sup>[22]</sup>. In dealing with these needs BI management helps, for instance via coaching<sup>[36]</sup> and co-productive management support<sup>[41]</sup>, to accelerate the learning curve, and thereby the development/innovation process<sup>[10]</sup>.

Altogether, this line of research is based upon the notion that intangible elements in the incubation process are the real contributions a BI makes<sup>[11, 21, 36]</sup>. It is therefore of concern that the extensive body of BI research up until now has focused upon the outcomes of the process, like income generated, jobs created and survival rates of tenants, rather than on these intangible elements<sup>[21, 33, 36]</sup>. On the basis of their 2004(b) review Hackett and Dilts<sup>[21]</sup> argue that there simply is too little evidence about BI managers' practices and how they contribute to tenant development<sup>[6, 21, 24, 36, 38, 41, 42]</sup>. Such an understanding is necessary to develop the capabilities of BI management, thereby raising quality and the industries' standards in management, policy and practice<sup>[23]</sup>. Hence, there is a need for process oriented research that investigates incubation via an understanding of management practices<sup>[6, 21, 23, 24, 36, 41, 42]</sup>.

Using this as a starting point, Patton et al.<sup>[36]</sup> tried to extend the literature on the contents of the incubation process, by searching for elements that underpin the commercialization of tenant businesses [36]. In doing so, emphasis was put on the relationships that form in the incubation process, for instance between the manager and tenants. Their results, based upon a single case study, constitute a model of eight elements that underpin the incubation process<sup>[36]</sup>. This model seems promising for it captures intangible elements that have not been distinguished as such before, like *developing commercialisation*

*skills in new business teams*. Nonetheless, some explanations of these elements remain unclear.

This paper contributes to the literature by means of a multiple case study and assesses whether the elements found by Patton et al. <sup>[36]</sup> are identifiable in other BIs. Besides testing the affiliation of BI managers and tenants with these elements, we also try to unpack the management practices that underlie these elements, for Patton et al.'s <sup>[36]</sup> descriptions remain a bit vague.

The paper is organized as follows: In section 2 the underlying theoretical constructs are clarified by means of a literature review. Section 3 describes the methodologies used to collect and analyse information. Section 4 presents the findings. Finally, section 5 presents the conclusion. Opportunities for future research are discussed within this section as well.

## 2 Literature Review

Although researchers have not reached consensus upon a single definition for BIs <sup>[6, 21]</sup>, commonalities can be found within the literature that give an insight into the concept and its content <sup>[40]</sup>. In the BI context incubating refers to a 'controlled' environment wherein tenants are nurtured/hatched <sup>[2, 38]</sup>. A BI is the producer of business assistance programs that are meant to create value and learning opportunities for tenants, within this 'controlled' environment <sup>[41]</sup>.

Scholars <sup>[6, 8, 10, 21, 25, 36, 41]</sup> recognize four components of assistance that generally are provided by BIs: 1) *infrastructural support*: available office space which can be rented under favourable conditions <sup>[6]</sup>; 2) *shared overhead resources* such as reception, parking space, availability of meeting rooms <sup>[10]</sup>; 3) Knowledge based *business support services*: such as coaching, training, attracting finance and business plan writing support <sup>[10]</sup>, and 4) *networking possibilities*: an internal network of likeminded tenants and an the BI's external network of professionals <sup>[25, 42]</sup>.

In their 2009 publication, Patton et al. <sup>[36]</sup> tried to extend the literature on the content of the incubation process, by searching for elements that underpin the successful commercialization of tenants' businesses <sup>[36]</sup>. This line of research originates in Campbell et al.'s 1985 publication <sup>[11]</sup>, which introduced a model containing four added values a BI offers to tenants. This model suggests that BIs deliver added value through the provision of intangible elements, such as *diagnosing and evaluating tenant needs* and *access to an expert network*, rather than through infrastructural support <sup>[11, 36]</sup>. Patton et al. <sup>[36]</sup> build on this line of research, by taking contributions into account that follow from relationships that form within a BI, as between BI managers and tenants; among tenants; and between tenants and the external network <sup>[36]</sup>.

The research they conducted was a single case study based on the high-tech BI of the University of Southampton, UK. Their findings resulted in a model of eight elements that underpin the commercialization of tenant businesses throughout the incubation process (Table 1) <sup>[36]</sup>. Because the explanations by Patton et al. are not always clear they will be elaborated considering additions by other researchers as well. The elements will be discussed subsequently.

**Table 1 Elements that Underpin the Incubation Process** <sup>[36]</sup>

1	A quality 'pipeline'
2	Picking winners
3	Monitoring and evaluating progress
4	Developing commercialisation skills in new business teams
5	Creating synergies within the internal support network
6	Building and maintaining an effective external support network
7	Access to appropriate funding streams
8	Managed exit

### 2.1 A quality 'pipeline'

Reasoning behind a quality 'pipeline' within a BI <sup>[36]</sup> is that a steady flow of new tenants has a positive effect on the goings of the BI. For it focuses the attention of current tenants on their own work, thereby pushing the pace of their commercialization agenda so that chances of finding technologies with clear market potential increase <sup>[36]</sup>.

Furthermore, a steady flow of new tenants also has a positive effect on the interest and enthusiasm of

the external network. The primary reason why the professionals in the external network are sharing their experience with the BI is their eagerness for promising and exciting business proposals<sup>[36,40]</sup>. A steady flow of such proposals will keep these professionals interested to be involved. In Patton et al.'s research participants acknowledged that the flow of new firms into the incubator was rather slow<sup>[36]</sup>.

## 2.2 Picking winners

Picking winners comprises the selection of high potential tenants only, whose ideas have a high potential for commercial application, growth or market success<sup>[2, 21, 36]</sup>. The selection of tenants and the associated entry criteria are an essential element in the incubation process<sup>[3, 10]</sup>. Literature on BI selection assumes that there are many potential tenants to choose from, creating the challenge of attracting a sufficient number of 'winning' applicants<sup>[3]</sup>. The reasoning behind the value of this element is that by selecting high-potentials, time and resources are devoted to the right initiatives, rather than to less promising business plans/entrepreneurs. Ideal candidates are likely to be judged on criteria such as technology focus, innovative products, high growth potential<sup>[3, 10]</sup>, characteristics of the tenant's market and his capabilities<sup>[2]</sup>.

## 2.3 Monitoring and evaluating progress

Monitoring and evaluating progress through real time feedback helps to contain downside risk for tenants, by preventing them from making costly and potentially terminal business mistakes<sup>[20]</sup>. This element is further highlighted by Hannon's statement that "*it is the managers ability to communicate, understand problems and resolve any tensions, and at the same time be a good listener and be able to give worthwhile advice, that will make the difference between a successful operation and one that is mediocre*"<sup>[11, 24, p.52]</sup>.

The relationship between the manager and tenant can be reinforced within the processes that monitor and evaluate performance/capabilities<sup>[36]</sup>. Rice<sup>[41]</sup> recognizes three strategies for this to take place: 1) reactive and episodic: the tenant requests counselling effort; 2) proactive and episodic: proactive management involvement on an episodic basis; and 3) continual and proactive: on-going review of developmental needs<sup>[41]</sup>. In Patton et al.'s study monitoring and evaluation was organized through informal interactions with the BI manager, and through formal business review panels<sup>[36]</sup>.

Hackett and Dilts<sup>[21]</sup> consider tenant drop-out during the incubation process to be a non-successful outcome of the process. However, if termination takes place in such a way that losses are minimized, it can also be seen as a useful strategy<sup>[36]</sup>. In the Southampton BI review panels are to weed out tenants that, according to them, are not in the position to achieve their goals<sup>[36]</sup>.

## 2.4 Developing commercialisation skills in new business teams

The following quote highlights the idea behind the next element: "*the problem of getting a bunch of very technical academics turned around and focused towards all the issues involved in starting a business isn't easy, they want to start one, but had no feeling of what starting one meant or was*"<sup>[36, p.627]</sup>. Due to their technological backgrounds tenants often have limited experience of business and its context<sup>[37]</sup>, so they lack competencies and knowledge required to operate a business<sup>[10, 41, 47]</sup>. Hence they might need help with matters such as marketing issues to be able to understand their future customers, or at what price customers would be willing to buy their products<sup>[42]</sup>. To overcome these liabilities BI support services try to make tenants aware of their inexperience, facilitate their ability to acquire appropriate knowledge and help to integrate such knowledge into the business context<sup>[37]</sup>. Hereby managers stimulate tenants to develop their commercialisation skills.

One difficulty within this element is that sometimes tenants fail to see the need for external assistance, and mistake support for interference<sup>[6, 36]</sup>. "*Allowing others to have influence and control over something I had created was difficult but the hardest part was realising how poor I was at the business side of things*"<sup>[36, p.629]</sup>. This quote shows that it can be hard for tenants to come to terms with sharing control<sup>[6]</sup>. Tenants might perceive too much formal intervention as interference, whereas too little involvement questions the value of the BI<sup>[36]</sup>. Managers should be aware of this, and be on their guard for losing balance.

## 2.5 Creating synergies within the internal support network

"*An important aspect of the value-added contributions of a BI is seen in its potential to foster cooperative interactions and synergies between the firms in-house*"<sup>[45, p.486]</sup>. Value is created because tenants, from similar industries and facing similar problems, learn from each other's experiences. Co-location enables this transfer of information, knowledge and experiences among tenants, as well as with the BI manager<sup>[25, 36, 42]</sup>. One task of the management lies in the recognition and deliberate encouragement of possible synergies among them, enabling shared learning<sup>[11, 42]</sup>.

Remarkably, Patton et al. [36] found that, while meeting with like-minded individuals was given as

a main reason for joining a BI in advance, after admission tenants do not endorse the value of internal networking<sup>[36]</sup>. Argumentations such as protecting intellectual property and restrictions in time/opportunities were mentioned to cause this shift in tenants' attitudes. However, the statements made by an external support professional that *'tenants do talk with each other'* and just *'one collaboration could be the catalyst'* indicated that the internal network was still perceived to be of (some) importance<sup>[36]</sup>.

## 2.6 Building and maintaining an effective external support network

Tenants are often in a disadvantageous position when it comes to acquiring resources, because they suffer from a phenomenon which is called 'liability of newness'<sup>[21, 45]</sup>. New ventures lack a track record, therefore they are less trustworthy and have more difficulties with attracting funds/resources<sup>[21, 25]</sup>. Tenants benefit from being associated with the BI<sup>[48]</sup>, and via networking<sup>[10]</sup>, as they experience legitimacy in the marketplace<sup>[10]</sup>. Thereby developing their credibility<sup>[21, 45, 48]</sup>, which in turn has a positive impact on their chances for survival<sup>[10]</sup>.

External BI networks include organisations such as universities, industry contacts and professional service providers like lawyers, accountants, consultants, marketing specialists, etc.<sup>[21]</sup>. Knowledge acquired via this network is of a known/proven value<sup>[25]</sup>, enabling a shortened learning curve<sup>[21]</sup>, at little cost of uncertainty<sup>[26]</sup>. Examples of such knowledge are information on competitors or potential customers<sup>[37]</sup>.

Via external networks, managers can make contributions to technological developments, by brokering between tenants and experts<sup>[41]</sup>. These are contributions that BI managers often cannot make themselves, because they lack a detailed understanding of tenants' technologies<sup>[24]</sup>. *"Therefore, developing and managing a networking infrastructure is a critical function of the BI"*<sup>[41, p.176]</sup>. As external networks enlarge the tenants' opportunities to learn, exploit knowledge, and to obtain access to resources<sup>[25, 42]</sup> and know-how<sup>[5]</sup>. In order for tenants to benefit from the network BI management has to fulfil an essential bridging function between tenants and experts<sup>[8, 24, 48]</sup>.

## 2.7 Access to appropriate funding streams

Attaining an appropriate level of investment is challenging for tenants, because substantial investments are usually required prior to revenue generation<sup>[32]</sup>. Campbell et al.<sup>[11]</sup> stressed the importance of venture capital for BI tenants. A lack of financial resources is one of the main barriers for high-tech SMEs<sup>[10]</sup>. BIs can support both by making tenants investment-ready<sup>[36]</sup>, and by providing contact with early stage investors such as business angels or venture capitalists<sup>[10, 21]</sup>. Next to funding, venture capital investors also play a role in professionalizing tenants, by supervising tenant activities to ensure their own investments<sup>[10]</sup>.

## 2.8 Managed exit

The idea behind a managed exit is to prepare tenants for an independent, self-sustained future<sup>[25, 36]</sup>. After their stay they will continue their operations, and will have to count on their own capabilities. The moment of exit from the BI should be prepared for in order to prevent uncertainty<sup>[36]</sup>. The director in Patton et al.'s research indicated that uncertainty could be reduced by interacting with graduated BI tenants. But there are other ways in which managers can prepare tenants for graduation, for instance help in searching for new residence.

Bruneel et al.<sup>[10]</sup> stress the importance of a timely graduation to guarantee an adequate turnover of tenants. A frequent policy to stimulate tenant graduation is an incremental increase of the rent<sup>[10]</sup>.

Now that Patton et al.'s elements that underpin the commercialization of tenant businesses are familiarized, the following section will explain the methodology as to how these elements are assessed in this research.

## 3 Methodology

*"Case study is a research strategy in which the researcher tries to gain a profound and full insight into one or several objects or processes that are confined in time and space"*<sup>[51, p.178]</sup>. In this research a multiple case study has been performed in which each case has been treated as an independent experiment<sup>[54]</sup>. Following the typology of Thomas<sup>[49]</sup>, the type of case study that describes this research is one in which *key cases* are the subject(s) of the research. The subject(s), meaning the institutions selected to provide information, are BIs. The 'key-ness' of a case manifests itself in its capacity to exemplify the object of inquiry<sup>[49]</sup>, so the BIs in the sample are key cases because they provide examples of what is of importance throughout the incubation process. The related research object, the frame of analysis within which the case is viewed [49], is therefore formulated as *the valuable elements*

that are of importance throughout the incubation process.

The research tries to increase the understanding of a broader issue, rather than focusing on a particular situation, therefore the purpose of this case study is *instrumental*. A second purpose of the research is to be *evaluative*. This type of case study is used to describe an intervention or phenomenon and the real-life context in which it occurred<sup>[4, 54]</sup>.

The next component in Thomas' <sup>[49]</sup> typology relates to the approach of the study. Firstly, this approach is *testing a theory*. This research tries to assess whether the elements in the Patton et al. model<sup>[36]</sup> are of importance in the assessed BIs. The second approach of this research is to *build a theory*, or rather to contribute to the development of theory, in order to unpack components of the incubation process and enhance understanding.

The last component of Thomas' <sup>[49]</sup> typology, process, is configured as a *multiple case study*. Since the cases are being studied concurrently, the process is a *parallel* case study. The process-wise procedure enables parallel collecting of information.

### 3.1 Data collection methods

Information was collected through semi-structured interviews, in which a list of questions (see Appendix) was combined with the flexibility to ask additional questions. Interviews took place in two rounds. The first round targeted questions in general, in the second round we added a focus on specific issues. After the interview, if permission was granted, a survey was sent to tenants. This was done to triangulate the information collected in the interviews.

The interview questions allowed for different response options, such as percentages, numbers or multiple choice answers. Some questions were using Likert scales from 1 to 7, where 1 is strongly disagree with the statement and 7 is strongly agree with the statement. In order for the interviewees to express their views in their own words the respondents could at any time during the interview elaborate upon the topic as they pleased. Besides closed questions there were also a few open-ended questions asked.

The choice for a majority of closed-ended question was made for several reasons, one being that this would ease the repetitiveness of the interview, as well as the comparability of the information that was gathered. Another reason for using closed-ended questions was that addressing all the issues as open questions would be very time consuming.

In order for the interview questions to 'fit' to BI jargon and context, suitable interview questions were sourced from a study performed by the CSES<sup>[12]</sup>. This study was commissioned by the European Commission, aiming to benchmark European BIs. Remarkably none of their respondents was Dutch. Measures for Likert scale questions were mostly sourced from a study by Hughes et al.<sup>[26]</sup>, and were revised to account for context where needed.

Before respondents were approached, a pre-test interview was conducted with a BI director. After this pre-test three questions were deleted and a few minor revisions were made in the formulation of other questions.

### 3.2 Interview protocol and analysis

In the initial protocol interviews were conducted face-to-face at the respondent's worksite. At the start the respondents were given a copy of interview questions so that multiple-choice and Likert-scale questions did not bother the pace of the interview.

Multiple potential respondents expressed a strong preference for the interview to take place per telephone, as for time limitations combined with an expressed "*quantum of research requests*", therefore the decision to deviate from the initial protocol was made. In the second protocol interviews would take place per telephone. For convenience the Likert-scale and some multiple-choice questions were sent and returned by email afterwards. Out of the final set of respondents (Table 2) twelve interviews followed the original protocol, the three remaining interviews were conducted by telephone. One respondent provided information by email solely. The interviews lasted between 45 and 65 minutes. All respondents agreed to be audio-taped. These tapes were used for transcription to enable detailed analysis. The language of the interviews was either Dutch or English, depending on the interviewer.

The final question of the interview asked for permission to approach tenants. If permission was granted the survey was sent to these tenants, either via the BI manager or directly. A total of 48 tenants filled out the survey.

To start the analysis the transcribed interviews were encoded with SPSS. Averages and standard deviations were calculated where appropriate. The answers to the open ended questions as well as the data in the SPSS file were analysed in a qualitative manner. Interpretation of the answers, combined with an interpretation of the documents that were provided by the respondents, provided more in-depth

information. In the end these findings were verified by the answers given in the survey.

### 3.3 Selection of cases

BI managers were interviewed to collect information. These managers were selected on the basis of the characteristics of their BI, rather than on the characteristics of individuals. A prerequisite for the BIs was that their tenants are operating in knowledge intensive industries, such as life sciences, space technology, energy and bio-industries. Table 2 shows the list of BIs that were consulted, divided into the varying BI types as recognized by CSES <sup>[12]</sup>. These types are distinguished to account for variety in the BI population. For practical reasons all respondents are Dutch.

**Table 2 List of Cases**

Business and Innovation Centre	University Business Incubator	Science/Technology Park Incubator	Specialised Incubator	Virtual Incubator
<ul style="list-style-type: none"> <li>• Dok41</li> <li>• Mac3Park</li> <li>• Tilburg Innovation Centre</li> </ul>	<ul style="list-style-type: none"> <li>• Biotech Centre/Triade Group</li> <li>• Erasmus MC Incubator</li> <li>• Starterslift</li> </ul>	<ul style="list-style-type: none"> <li>• Kadans Biofacilities</li> <li>• Mercator Incubator</li> <li>• Matrix Innovation Centre</li> </ul>	<ul style="list-style-type: none"> <li>• BioPartner Leiden</li> <li>• BioPartner Maastricht</li> <li>• Dutch Game Garden</li> <li>• ESA Business Incubation Centre</li> <li>• Greenhouse</li> </ul>	<ul style="list-style-type: none"> <li>• StartLife</li> <li>• VentureLab Twente</li> </ul>

### 3.4 Validity and reliability concerns

Case studies enable a researcher to study phenomena in a real-life setting, where boundaries between context and phenomena tend to be blurred <sup>[47]</sup>. The natural science model is the most common model to ensure the rigor of case study research <sup>[16]</sup>, as to overcome these blurred boundaries. It divides these boundaries in four criteria: construct validity, internal validity, external validity, and reliability <sup>[16, 54]</sup>.

Construct validity deals with establishing correct operational measures for the concepts being studied <sup>[54]</sup>. In the case of this research it was met by the operationalization of the theoretical concepts, which had partly been performed by CSES <sup>[12]</sup>. Using questions that had been formulated and used for this benchmark study increased the credibility of the research. The same holds for the Likert scale questions, since the formulation of these statements had been developed by Hughes et al. <sup>[26]</sup>. A pre-test interview also strengthened the construct validity.

Another positive contributor to the construct validity is the triangulation of sources. The use of interviews and a survey to collect information enabled us to look at the cases from multiple angles. The fact that not all interviews were conducted following the same protocol has a negative influence on the construct validity of this research.

Internal validity deals with establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships <sup>[54]</sup>. Methods to increase the internal validity of a research are pattern matching, explanation building, and addressing rival explanations or using logic models. Since the interview respondents did not belong to the same BI, different viewpoints on the topics of interest have been expressed. Rival explanations will be discussed in Section 4.

External validity deals with establishing the domain to which a study's findings can be generalized <sup>[54]</sup>. Due to the scope of the research and time constraints the results are based on sixteen interviews, only one interview per BI. Besides that BIs are context specific institutions <sup>[25]</sup>. Therefore the generalizability of the findings of this research does not allow for a statistical generalization <sup>[49]</sup>. Analytical generalization denotes a process that refers to the generalization from empirical observations to theory, rather than a population <sup>[16, 54]</sup>.

Reliability deals with demonstrating that the operations of a study, such as the data collection procedures, can be repeated and then lead to the same results <sup>[54]</sup>. Reliability can be improved by using case study protocol and developing a case study database. For the purpose of this research a case study protocol was developed, but due to respondent preferences we had to deviate from the protocol. This has a negative influence on the reliability. Taping the interviews, using a standardized list of interview questions and converting this response into a transparent encoding enables an easy replication of the research. This is a positive contributor to the reliability of the research.

Now that the methodologies used to collect and analyse information are described, the following section will present the findings of this paper.

#### 4 Findings

Table 3 displays key performance statistics from the CSES benchmark study <sup>[12]</sup>. When comparing their averages and suggested benchmarks with the findings of this research, it shows that the respondents in this study are in accordance with these statistics. Although the number of management staff is relatively high, the sample is deemed to be illustrative for the BI industry on the basis of these scores.

**Table 3 BI Benchmarks and Averages**

	Average from CSES	Benchmark	Average from Sample
Incubator Space	3000 m <sup>2</sup>	2000-4000 m <sup>2</sup>	4735 m <sup>2</sup>
# BI Tenants	27	20-30	25.8
Occupancy Rate	85%	85%	87.6%
Length of Tenancy	35 months	3 years	2.9 years*
# Management Staff	2.3	2	3.4
Ratio BI Staff : Tenants	1:14	1:10-1:20	1:12
Percentage of managers' time advising tenants	39%	50%	38.7%
For-Profit : Non-Profit BIs	2:8	x	3:8

\*One outlier case was excluded here, for some specialist BIs have longer product development lead times <sup>[12]</sup>.

When examining these benchmarks it shows that four out of the five largest BIs in the sample are operating for-profit. So it seems that for-profit BIs have more acreage. This might also influence the slightly higher average BI space in the sample, in comparison to the benchmark.

It is noteworthy that this was the only clear difference between for-profit and non-profit BIs. There were no differences to be found between the BI's objectives, years in business, BI type nor services provided between non- and for-profit BIs.

The most common BI objective is *to contribute to competitiveness and local job creation* <sup>[12]</sup>, respondents in this sample also gave this as an answer. The second most important objective is *to help universities/R&D centres commercialise know-how*, the choice for this is larger in the sample than in the CSES report. Only one respondent mentioned *profit* as an objective, as another one explains: *“I would love to merit tons of money, but reality is different. Incubators will not make profits themselves. We do offer value, by selling knowledge and contributing to the developments of the region, and at the end there are some cents for us left, but no large profits.”*

Besides enabling for checking the information gathered in the BI manager interviews, the survey also enables a ranking of the services that are deemed important by tenants. A list of thirteen services that might be provided by BIs was proposed to tenants (Table 4). When looking at their response, access to a network is valued most, with an average score of 5.5 (where 1=*not important* and 7=*very important*). The second and third most valued services both comprise access to financial resources.

**Table 4 Tenants' service preferences**

Service	Tenant Ranking	Average Tenant Preferences	Percentage of BIs Offering the Service [2]
Networking, e.g. with other entrepreneurs, potential customers	1	5.5	88%
Help with raising bank finance, grants, seed and venture capital	2	4.5	79%
Incubator seed/venture capital fund, business angel network	3	4.4	48%
Mentors, board members and other senior advisers	4	4.3	x
Accounting, legal and other related services	5	4.2	51%
Support business planning and forming a company	5	4.2	86%
Pre-incubation services	6	3.6	68%
Advice on development of new products and services	7	3.5	61%
Market research, sales and marketing	8	3.3	53%
Training to develop business skills	9	2.6	x
Help with exporting and/or partner search abroad	9	2.6	52%
Advice on recruitment of staff and personnel management	10	2.4	39%
Help with e-business and other aspects of ICT	11	2.2	54%



The last column of Table 4 indicates the percentage of BIs that offer this service to tenants, these results were generated by Aerts et al. in a European study surveying 140 BIs <sup>[2]</sup>. This shows that the most valued BI services are indeed provided by the majority of BIs.

In our own sample BIs indicated to be able to provide nearly all of these services, either in-house or via the network, if there was a perceived need to do so. The least offered service in our sample was *giving advice on recruitment of staff and personnel management*, which was still offered by a majority of BIs.

Now the general findings are presented the following sections will present the findings considering the perceived importance of the elements that, according to Patton et al. <sup>[36]</sup>, underpin the incubation process. Herein we reclassify these elements into three categories: 1) elements that respondents identify with, 2) elements that respondents do not identify with, and 3) elements that are cumbersome.

#### 4.1 A quality 'pipeline'

Considering the first element, a quality pipeline, seven of the BI managers indicated that they are content with the current flow of tenants, flow being the entire stream of tenants in the incubation process (inflow, throughput, outflow). One manager explains that *"if I want to help more companies, that costs more. We need some financial stability and therefore we don't want the flow to be too fast."* Four managers indicated that their flow could go faster, one of which said that time was the limiting factor to actually make this work. Overall it seems that having a stable flow is the target, for this enables BI sustainability, but an added value for tenants could be exhibited from this element.

Tenants did not experience a fast flow of tenants coming nor leaving the BI. On top of that they are rather negative towards increasing the flow of new tenants, for they reasoned that the outflow of tenants should depend on the tenants themselves. According to them there is no need for the BI manager to intervene by hurrying/slowing down a tenants' developmental processes for the sake of the BI. On the basis of the above we assign a quality pipeline to the group of cumbersome elements.

#### 4.2 Picking winners

Picking winners requires selection procedures to find tenants with the highest potential [36]. Selection procedures vary per BI. Some BIs solely have intake meetings, mostly between the potential tenant and the director. In other BIs selection is more comprehensive: in five BIs, potential tenants have to present their business plan to a selection committee consisting of representatives from finance, knowledge institutions, large companies, entrepreneurs and innovation experts. In one BI this committees' judgement is decisive, so the manager does not have a say in tenant admission. When external organizations are involved in the selection procedure more selection criteria are considered. However, the BIs that have external organizations in the selection committee have an average admission-percentage of 43%. This is not so different from the total samples' admission-percentage of 43.8%. Thus external selection committees are not necessarily more rigorous.

It varies per BI which criteria are of importance throughout the selection procedure. The criterion that is considered of importance by most BIs is that the *business must have an innovative project*. For specialised BIs it comes as no surprise that tenants should *operate within the BIs' domain*. *Finance must be in place* is not an important selection criterion.

In relation to *picking winners* one of the BI managers made the remark that *"if it were possible to select the best business plans then this BI would no longer need to exist. For the potential of a business plan is always connected to timing and the current economic situation, it is therefore impossible to make a definite judgement to decide which business plan is the best one"*. One contradicting remark is that it is necessary to properly assess tenants before allowing them entrance, for the BI is sponsored with public money. *"This comes with the responsibility to make autonomous and sensible decisions."*

In general, the BIs in this research do practise selection procedures to judge tenants before admission, but they are not judged on being a *winner*. Expressions as *"can the tenant be a showcase for the incubator"* and *"we assess whether these individuals have what it takes to be an entrepreneur"* indicate that potential tenants are selected on the basis of their fit to the BI and their abilities. Potential is certainly considered hereto, but more as to indicate possibilities, rather than to select the 'most successful' entrepreneurs. One manager acknowledged this by saying that *"an incubator gives you the idea to let the entrepreneurs with the highest potential come to us. We will offer them so much services and we will pamper them so much with help and money that they can only be successful. Such an attitude attracts a certain kind of entrepreneurs, one that I don't want here. I prefer the ones that come here and say: I can do this and I will, over the ones that come here to be pampered and want me tell them what to do."*

#### 4.3 Monitoring and evaluating progress

We found that monitoring and evaluating tenant progress is practised, and mostly takes place via informal meetings. The way of management to keep in touch with tenant proceedings mentioned by all respondents was *proactive and episodic*, which comes down to counselling by walking around<sup>[41]</sup>. Formal meetings are less frequent than informal ones, and do not take place in some BIs. Formal meetings take up different forms, such as half-yearly progress reports or interviews, but none of the BIs use review panels involving external parties. So, in contrast to the selection procedure, no external parties are mentioned to consult failure in the incubation process.

Respondents indicated that it is hard to put a time frame to the occurrence of informal and formal meetings, because it varies throughout the incubation process. New tenants need more guidance than tenants that have been working in the BI for two years, so the amount of meetings decreases over time. This confirms a customized way of organizing support.

When asking for the most important management function, the majority of BI managers choose *providing advice and assistance to tenant companies* as meaningful. On average they spend 40.6 % of their time to this task.

Along with this some BI managers participate in setting a clear business agenda for tenants. In a few cases such business plans may include a time schedule as to when specific objectives will have to be accomplished. Independently from involvement in planning, managers indicate that if tenants do not manage to achieve their goals (in time), the majority of BIs will come to a point where the co-operation is ended. Closely connected to this is that a large majority of the managers considers failure of a tenant to be a *part of the process*, rather than a negative event.

#### **4.4 Developing commercialisation skills in new business teams**

The managements' view on the next element, developing commercialization skills in new business teams, is that the managers' role is of mediocre importance. Theoretical reasoning behind this element is that tenants, being technical experts, have limited experience of business and its context<sup>[41, 47]</sup>. BI managers could make contributions here by training/coaching tenants in the process of getting to the market<sup>[10]</sup>. In reaction one BI manager highlights the notion that he is not a teacher, "*I do not have the skills to really teach skills, but I can point to where they should look for, and arrange meetings with professionals.*"

Tenant response on this element varies from "*I can always spar with the manager about new ideas*" up to "*the management is not involved in this, and doesn't need to be.*" This also indicates a customized way of organizing support.

Based on these findings we question the extra value of the element 'developing commercialisation skills in new business teams'. It does make sense that some tenants have limited experience of business and its' context<sup>[37]</sup>, but in that sense support in developing commercialisation skills can be just as valuable for one as support with business planning or personnel recruitment for another. It totally depends upon the particular tenant, his capabilities and needs. Therefore the real value of this element lays in a customization of support, something that follows upon monitoring and evaluating a tenants' needs (over time).

Therefore, from a theoretical notion, it is suggested that Patton et al.'s elements *monitoring and evaluating progress* and *developing commercialisation skills in new business teams* should not be treated as separate elements. Instead, to capture these elements together we suggest that *on-going tailor-made management advice and assistance*, provided that, in order to be able to give tailor-made advice an on-going monitoring and evaluation of progress is required, is a better representation for the intended value of the relationship with the BI manager.

To not lose track of the notions such as that tenants might need support in developing commercialization skills, a checklist can be developed consisting of needs that are of frequent occurrence. For example, one of the interviewed BIs indicated that tenants had to participate in an entrepreneurial assessment in order for the BI manager to estimate their capabilities. Standardizing (and formalizing) such practices can improve and ease the managements' job in tailoring advice and assistance.

#### **4.5 Creating synergies within the internal support network**

The next element, creating synergies within the internal support network, is confirmed to be of importance by all BI managers. Table 5 displays the average management scores for the given statements, where 1=strongly disagree and 7=strongly agree. Table 4, at the beginning of this chapter, already showed that networking in general (both internal and external) is highly valued BI tenants. This contradicts the work of Patton et al. for their tenants were not so positive about internal networking.

It shows that the internal network is frequently used for the exchange of information and experiences,

so tenants do experience shared learning. BI managers also encourage tenants to participate in this kind of networking and to share their own experiences. This endorses the importance of creating synergies within the internal support network.

**Table 5 BI manager networking views and practices**

List of Statements	Average	Standard Deviation
1. Exchange of information and experiences takes place frequently and informally among members of the incubator	6.13	0.99
2. Our tenants experience shared learning with some of the other businesses in the incubator	5.13	1.25
3. I encourage tenants to learn from and share experiences with each other	6.13	0.64
4. Our tenants learn a great deal from the members of the businesses external network	5.63	1.06
5. I encourage tenants to learn from external individuals/organizations	5.75	0.89
6. If a tenant experiences a problem that I cannot help to solve, I mostly bring him in contact with a professional within the network	6.36	0.52
7. If a tenant experiences a problem that I cannot help to solve, I mostly tell him to discover a solution by himself	2.75	1.58
8. Tenants tend to hang on too much to the incubator's network	2.75	1.49

#### 4.6 Building and maintaining an effective external support network

Managers can make contributions to technological developments via external networks, by brokering between tenants and experts<sup>[41]</sup>. BI managers stated that tenants do learn a great deal from the external network, and BI managers encourage acquiring knowledge via this route (see Table 4). When it comes to problem solving tenants are connected to the external network rather than that they are pushed to find a solution for themselves, as one manager stated: *“why on earth would you make them reinvent the wheel themselves?”*

#### 4.7 Access to appropriate funding streams

All BIs indicate to be in contact with multiple organizations, such as business angels, venture capitalists and local institutions, in order to attract finance for tenant investments. Also informal investors are mentioned, *“they are former businessmen that invest amounts between the 100,000 and 600,000 euros. We also have some contacts with larger players, and they say to be interested, but when it comes down to it they back off because they find the projects too small.”* Only one BI in the sample actually takes a share in tenants itself. The survey indicated that access to funding streams and help with making the tenants investment-ready is highly valued by tenants.

Despite the fact that this element is perceived to be valuable, we categorize it in the group of cumbersome elements. This is because actual access to appropriate funding streams takes place via the BIs network, so boundaries between these two elements are blurred, and therefore cumbersome and cluttered. To better capture the value underlying this element we suggest the simple formulation of *support with funding*.

#### 4.8 Managed exit

According to Patton et al. the moment of leaving the BI should be prepared for in order to prevent uncertainty<sup>[36]</sup>. The somewhat hesitant response by the BI managers indicated there was no real concern for this element. Most of the BI managers do not know for how long a tenant will remain in the BI. Only four BIs work with a fixed time of stay for tenants, but indicate to be flexible when tenants have reached these time slots. So the managers find renting for a fixed period of time to be a non-important exit criterion. The only exit criterion that is recognized as influential for leaving the BI is a need for extra (office) space. The majority of managers indicate not to help tenants prepare for leaving the BI.

It also varies per BI what a tenant should have accomplished before being ready for graduation, in most cases this is not strictly specified. The common tendency is that tenants should be able to make the next step as to sustain business, so their business should be viable. But it differs per tenant how this is determined/evaluated. Some achievements that are mentioned as requirements for a tenant to be ready for graduation are for a tenant to have its first customers, or that he made sure his technology is patented.

Now that our findings have been presented and interpreted the following section of the paper will conclude upon our research. Opportunities for future research will be elaborated upon at the end of this section as well.

## 5 Conclusion

Following a request for research that investigates incubation via an understanding of management practices and networking interactions<sup>[21]</sup>, we extend prior research that holds intangible elements to be the foremost contributors to the incubation process<sup>[11, 21, 36]</sup>. As a starting-point for this research we evaluate the model of Patton et al.<sup>[36]</sup>, which consists of eight elements that underpin successful commercialisation of tenant businesses in the incubation process. We complemented these elements by means of a literature review, and then assessed affiliation with these elements by means of a multiple case study, interviewing BI managers and surveying tenants.

The use of the qualitative approach has provided an in-depth understanding of the important elements of the incubation process. Notwithstanding the recognition of- and appreciation for most of the values covered by the elements of the Patton et al. model, we conclude that the model is cumbersome and therefore not very useful to comprehend the incubation process. Based upon our analysis we divide these elements in three categories; 1) elements that respondents affiliate with, 2) elements that respondents do not affiliate with, and 3) elements that are cumbersome.

The elements *creating synergies within the internal support network* and *building and maintaining an effective external support network* are well supported in this research. Managers as well as tenants consider networking, internally and with external parties, to be an important activity for transferring knowledge and experiences into tenant businesses. These networking activities are both facilitated and encouraged by BI management.

The managers in our sample did not really affiliate with *picking winners*. Selection of tenants does take place by means of varying selection procedures, the most comprehensive ones involving external selection committees. But these selection procedures are to select tenants that are a good match to the BI, rather than the ones with the highest potential for business success. One practice worth mentioning is a test that assesses whether the potential tenant has got what it takes to become an entrepreneur.

Another element that was BI managers did not affiliate with is *a managed exit*. This element is not much of concern for the BIs in the sample. Only four BIs work with a fixed time of stay for tenants, but indicated to be flexible when tenants have reached these time slots. It also varies per BI what a tenant should have accomplished before being ready for graduation, and yet still it differs per tenant how this is determined, and some BIs do not even identify with the graduation as such.

The first element that we classify to the third group is *a quality 'pipeline'*, which mainly serves to ensure the sustainability of the BI itself, rather than contributing to the tenants' business. To be fair, the external network was not assessed in this research, so the argument that a steady flow of new proposals will keep these professionals interested and involved might hold. But we do believe that this element is just a cumbersome way of addressing the need for a sufficient occupancy-rate.

*Monitoring and evaluating progress* is appreciated by the managers in the sample. Informal meetings take place regularly, but formal external review panels as Patton et al. describe are not consulted, not even in situations in which a tenant terminates its business. BI managers evaluate such tenant failure as part of the process.

However, monitoring an evaluating does not clearly distinguish itself from *developing commercialisation skills in new business teams*. Both elements are based on the view that BI managers contribute through interactions with tenants, relying on a customized way of offering this support. Therefore we propose to reformulate these two elements into the following one: *on-going tailor-made management advice and assistance*, on the condition that on-going monitoring and evaluation of progress is necessary in order to be able to give tailor-made advice and assistance.

Also *access to appropriate funding streams* is recognized as a cumbersome element. Supporting access to investors is highly valued by all parties involved, but in this formulation it does not clearly distinguish itself from networking. To better capture the value underlying this element we suggest the simple formulation of *support with funding*.

An interesting notion for future research is to develop a checklist of tenant needs that are of frequent occurrence, like the need to develop their commercialization skills. Constructing such a checklist, along with the tests that are to check for such needs, can standardize and thereby unpack some of the learning tendencies throughout the incubation process. It would also be interesting for future research to examine whether dependence on a network, as to acquire knowledge and experiences, might harm the entrepreneurial orientation of tenants. Ambidexterity might be of concern, because tenants develop via experimenting (to establish innovation) but at the same time gather existing knowledge from professionals. The direct returns from the exploitation of existing knowledge are higher, putting the long-term gains out of explorative/entrepreneurial activities at stake.

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## The Impact of China Aid and Investment in Africa Development, Opportunities and Challenges

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**Abstract:** The purpose of this paper is to explore the increasingly important economic and business relationship between the People's Republic of China and the countries of Africa. My focus is on how this partnership manifests itself in investments. The research questions are: first, how has the relationship changed over time and second, from an African perspective has this relationship been beneficial? Finally, how has the recent economic downturn affected their partnership? My investigation shows that Chinese investment has been motivated by a desire to access critical resources (oil, bauxite, etc.). Regarding the recent year's trend of international business, process and outcomes of globalization, such as economic, social, cultural, environmental and political has great impact for enterprises or countries to grown internationally. Although the research shows that growth in developed countries is expected to continue to be lower than many developing countries like China and African countries. Reason why strengthening international cooperation or cooperation multi bilateral and partnership between companies of developing countries has a significant importance for the internalization of their activities.

**Key words:** Statistics on the Chinese Presence in Africa; Opportunities and Exploration on Development Right; Challenges and Implications

### 1 Introduction

Since opening up to foreign trade and investment in 1979, China has emerged as a major economic and trade power. China's rapid economic growth has sharply improved Chinese living standards and helped raise hundreds of millions of people out of extreme poverty. China's recent push into Africa is driven by a need to find oil and industrial raw materials to feed its resource-guzzling and the world's fastest growing economy, the second largest economy in the world. China's economy has grown by an average of 9 per cent per annum in the last 25 years and its energy consumption has doubled and outstripped domestic energy production.

Actually, there are three aspects to China's strategies in Africa. First aspect, from 1850 to 1950 related to colonial labor demand called "coolie trade." Coolie trade focused mainly on plantation, mining, and railway construction. At the same time Chinese officials mostly use public diplomacy, including high-powered official visits and a triennial Forum on China-Africa Co-operation (FOCAC), to court and cultivate African elites. Within the last decade, President Hu Jintao has visited 17 African countries. Premier Wen Jiabao and senior officials of the Politburo have also undertaken the safari trip to Africa. Through these deepening engagements, China seeks to build solidarity with African governments and to present itself as a reliable interlocutor between developing countries and the developed West. Secondly from 1960 to 1980 subsequent cold war, Chinese authority pledges large amounts of aid and investments by challenging superpower in order so cement south-south relation, with no political strings attached, except withdrawal of diplomatic relations with Taiwan. The third, China's "going global" strategy, involves the use of aid donations to encourage Chinese companies to internationalize and acquire overseas assets, especially oil assets, it involved co-operation on investment, financial operations, debt relief and cancellation, agricultural, natural resources and energy, infrastructures, education, and multilateral matters.

Nowadays, major Chinese companies have hit roadblocks in well established markets, but Africa's markets are untapped and strategically open. Africa has therefore become a strategic training ground for Chinese companies, through public diplomacy, benign trade terms and large aid and investments deals with no political strings attached except China has gained considerable access to Africa's resources and consumer markets. China now receives 32 per cent of its oil imports from Africa, with Angola overtaking Saudi Arabia as the largest exporter of crude oil to China and major importation of bauxite from Guinea. Although, there is great and plenty optimism about the potential benefits of the new China-Africa co-operation, skepticism also abounds among local groups and the international community.



Most African government officials, embittered by unfavorable aid conditions imposed by the cartel of the Paris Club and the international financial institutions, see China as a reliable, no imperial alternative player that offers and inspires alternative routes to development. They are gratified that their ailing economies are being bolstered by high Chinese demand for their resource exports and by large investments in infrastructure and other critical sectors long neglected by Western donors.

For traditional donors, it is time to engage China as a major player in designing the rules of global economic governance and to review aid conditions to identify what does and does not work for African development in order to continue to remain influential and credible in Africa. As a result: Africa's growth has become increasingly linked to China's. There is a 92% statistical correlation between growth in sub-Saharan Africa and China. In the last few years China is the largest investor in and lender to Africa, as well as the continent's largest trading partner. "Africa's growth is underpinned by China's demand for commodities," says Martyn Davies, CEO of Frontier Advisory and director of the China-Africa Network at the Gordon Institute of Business Science. "This has pulled Africa out of the crisis and poverty. Over the next 10- 15 years, this interdependence will grow." However, there has been intense debate about whether China has been good or bad for Africa. As view, is that Chinese investment is positive for the capital-starved African continent and the growth benefits are starting to trickle down to consumers. The question is How firms ,countries or even continent position themselves and the extent to which they are able to make the most of the growth opportunities will determine who will really grow in the next decade and who will confine themselves to the much smaller market?

## 2 Literature Review

### 2.1 Phases of Engagement

Historical evidence shows that there have been economic and political relationships between China and Africa as far back as 500 years ago and has developed prosperous business partnership. Developing the friendly cooperation with Africa, China has always upheld the principles of "sincerity and friendship, equality and mutual benefit, unity and cooperation, and common development", respecting the sovereignty and will of African countries, and promoting all-dimensional cooperation.

Regarding to that, China and Africa have enjoyed a long-standing friendship. Since the founding of the People's Republic of China, China-Africa relations have developed continuously, as evidenced by a deepening cooperation in political, economic and cultural areas and by the creation of a new type of strategic partnership based on political equality and mutual trust, economic win-win cooperation and cultural exchanges. Over the past 60 years relationship with African countries, China has adhered to the principles that stress sincerity, equality and mutual benefit, solidarity and cooperation development. It has demonstrated respect for the will and choices of African countries, actively encouraged cooperation between Chinese and African businesses, and shown its sincerity in aiding African development. Trade and economic cooperation has achieved remarkable results, having grown in size, scope and areas of cooperation and having yielded benefits to the peoples of both China and Africa. However, this relationship stands as a fine example of south-south cooperation. While China is the largest developing country, Africa is the continent with greatest number of developing countries. China-Africa trade and economic cooperation has not only played a significant role in promoting their respective progress, but has also helped to win the attention and support of the international community to Africa's development. Currently, China is one of Africa's most important trade and economic partners. As the first systematic record of the past and present of China-Africa trade and economic relations, this article aims to promote understanding of this relationship both among the Chinese and Africans and within the international community, and advocate the principle of equality, mutual trust and common development which China has always adhered to in its cooperation with Africa. The report also strives to encourage people from all walks of life who are concerned about African development to increase support to Africa, as the continent pursues sustainable economic and social development.

Between 1978 and 1999, the complementarities between China and Africa came into full play, thus deepening trade and economic relations between the two sides. Together with the rapid growth of bilateral trade, Chinese companies began to contract to engineering projects in Africa, provide Africa with skilled labor, and establish equity and cooperative joint ventures on the continent. At the same time, African businesses started to invest in China. Entering into the twenty-first century, China and Africa expressed their mutual desire to further strengthen their consultations and cooperation. They created the Forum on China-Africa cooperation (FOCAC) and held the first Ministerial Conference under the FOCAC framework in Beijing in October 2000. Under the framework of FOCAC, the Chinese government introduced a host of important measures to facilitate cooperation with Africa, including the eight measures

announced at the Beijing summit. These measures cover a broad spectrum of areas, such as debt relief and zero-tariff treatment, further development assistance, investment promotion, concessional loans, medical care and public health, science and technology, and human resources.

### **2.3 Motives**

In view of the above aid strategy, one may suggest the main motive for Chinese relationship is to gain access to the abundant raw materials that Africa offers. Although this may be a good reason, Alden (2005) states that China's insistence on recognition of its "one China" policy by Africans as another important requirement. Alden (2005) also lists four factors that have shaped China's contemporary African policy: China's need for energy security; new market and investment opportunity; symbolic diplomacy and development; and forging strategic partnerships. According to researcher, the main drivers of the China Africa cooperation are defined by recent statement by Chinese government on two issues. One is on cooperation, "China will continue to strengthen solidarity and cooperation with African countries in the international arena, conduct regular exchange of views, coordinate positions on major international and regional issues and stand for mutual support on major issues concerning state sovereignty, territorial integrity...." The other one is the fact that "The one-China principle is the political foundation for the establishment and development of China's relations with African countries and regional organizations."

From 2000 to 2009, trade and economic cooperation between China and Africa grew rapidly. Yearly statistics show that bilateral trade raise from 10.6 billion USD to 91.07 billion USD. While China's investment in Africa increased from 220 million USD to 1.44 billion USD, Africa's investment in China increased from 280 million USD to 1.31 billion USD.. China's assistance to Africa increased tenfold, with primary focus on such social welfare and capacity building undertakings as poverty alleviation, medical care and public health, education, training and infrastructure. In addition, this period saw expander cooperation in finance, telecommunications, tourism, shipping, environmental protection, and clean energy. African countries partnering with China today are signing with a future world superpower.

In Africa, this Chinese alliance provides strong psychological consequences. It provides economic hope and shows African elites an example of success which they may take as exemplars of their own future.

In somehow, if Chinese investments in key sectors of infrastructure, telecommunication, manufacturing, foods, and textiles radically alter the African continent, the main change will have taken place in African minds. With the recent growth and economic improvement, more Africans students are returning to Africa after studies abroad in order to bring their skills and industry home. With key infrastructure in place, Africa has a future.

## **3 Statistics on the Chinese Presence in Africa**

By the end of the 1990s, Africa's economy had stagnated and in most countries average growth rate had turned negative. Within the last three years, however, most African countries have sustained steady growth, driven by buoyant global demand for oil and industrial raw materials and improvement in domestic supply response. Africa has grown above the world average and faster than Latin America since 2002. Africa's output grew by an estimated 5.5 per cent in 2006 and is projected to grow at 5.9 per cent in 2007, falling marginally to, but still at a high rate of, 5.7 per cent in 2008, according to the OECD and the African Development Bank. The deceleration is attributed to an expected slow-down in South Africa, the largest economy south of the Sahara. Growth in net oil-exporting countries continues to be more robust than in net oil-importers. Nowadays global high demand for oil and industrial raw materials has encouraged foreign direct investments (FDI) in many of Africa's resource-rich countries, particularly from China and India, the fastest growing developing countries.

According to UNCTAD, FDI to Africa grew by 25 per cent to a record \$39 billion in 2006 and went mainly to the extractive sector. FDI flows to developing countries as a whole grew by only 10 per cent to \$368 billion in 2006. The growth rate in FDI to Africa was the second fastest behind the rate of 55 per cent in South-East Europe and the Commonwealth of Independent States, which received \$62 billion in FDI flows. West Asia attracted \$43 billion in FDI inflows, an increase of 23 per cent over the previous year, and was dominated by Turkey and oil-rich Gulf States, while South, East and South Asia experienced 13 per cent increase in FDI flows to US\$187 billion, with China, Hong Kong, Singapore and India as the largest four recipients. China and India have also emerged as new outward investors. FDI flows to Latin America and the Caribbean region fell to US\$99 billion, with Mexico and Brazil as the largest recipients. Most FDI flows to developing countries went to the extractive sector. According UNCTAD, cross-border mergers and acquisitions in the extractive and related service sectors in the first

half of 2006 were three times more than the level in the same half in 2005. Consequently, FDI flows to Africa were uneven, with large concentrations in West, North and Central African regions. Low-income African countries without natural resources were the least attractive to FDI.

### 3.1 Chinese aid and debt relief

China has pledged continuing development assistance and government-backed FDI to African countries. By December 2006, China had given over US\$5.5bn in aid to African countries. At the 2006 Summit of the Forum on China-Africa Co-operation (FOCAC) in Beijing, China pledged to double aid to Africa by 2009 and to give Africa US\$2 billion in preferential buyers' credits over the next three years. China's Export and Import Bank (Eximbank), established in 1994, extended its export buyers credit market to Africa in 2005 and by the end of that year had committed US\$800m concessional loans to cover 55 projects in 22 African countries, according to a recent World Bank study. Chinese aid to Africa has focused on two main areas: infrastructure and human development. Chinese aid provides funding for highly visible and to many minds, important infrastructure projects, which Western donors have long since stopped financing.

Chinese human development assistance has focused on training and the provision of health personnel. Through the African Human Resources Development Fund, China awards scholarships to over 4000 students from 51 African countries to study in China every year. The recently launched China-Africa Inter-Governmental Human Resources Development Plan is part of China's strategy to cultivate African elites through training courses and seminars for middle and high ranking African diplomats and economic and management officials. In the next three years, 15000 African professionals will be trained up while 10 special agricultural technology centers will be created. China also sends Chinese trainers to Africa to give short-term courses, including on malaria prevention and treatment, applied solar energy technology and maize farming. Over the decades, China has sent nearly 15,000 medical workers to Africa and treated 170 million patients on the continent, the Chinese state-run Xinhua News Agency has said. At FOCAC 2006, President Hu also pledged to build 30 hospitals in Africa and provide a 300 million Yuan grant to fight malaria. Recently, China has added sports development to its assistance to Africa, and has sent about 38 coaches to 12 countries, including for the development of table tennis, and provided assistance for the construction of sports facilities, including the building of stadiums in Guinea and Ghana which held the Confederation of African Football Cup of Nations competition in 2008. China exerts no political pressure on African governments for political and economic reforms, although such massive economic and financial assistance cannot avoid having political repercussions. China's only declared condition is the recognition of its "one-China" policy, by which African governments are expected to break off diplomatic relations with Taiwan. One-third of the countries that recognized Taiwan were African, including the regional power South Africa. But in return for development assistance from Beijing, many African countries have severed diplomatic links with Taipei. See Figure 1 trade between China and Africa



Figure 1 Trade between Africa and China

In spite of Taiwan's reported campaign donations to Mandela's African National Congress in 1994, South Africa was compelled to break ties with Taipei in 1998 after Mandela failed to convince Beijing to agree to a dual recognition policy. Other countries including Senegal and Chad have followed South Africa in repudiating Taiwan. 47 of Africa's 53 nations have established diplomatic relations with Beijing, according to the Embassy of the People's Republic of China in the United States. There now remain only a handful of African countries like Sao Tome and Principe that recognize Taiwan, but these are economically and politically insignificant. Even so, China is extending its largesse to these countries to win them over from Taiwan. "China stands ready to establish and develop state-to state relations with countries that have not yet established diplomatic ties with China on the Basis of the one China principle," according to China's Africa Policy paper.

In contrast to other donors, China usually does not offer grants to African countries, but to increase its leverage on borrowing countries, China forgives the debts of borrowers that develop strong political and economic relations with it within an agreed timetable. This is probably what Chinese officials mean in their Africa Policy as being "ready to continue friendly consultation to seek solution to, or reduction of, the debts they [African countries] owe to China." By December 2006, 10.9 billion Yuan (US\$1.4 billion) of debt owed by 31 heavily indebted and least developed African countries had been forgiven, the state-run Xinhua News Agency has reported. It has also been observed that Chinese aid coincides with the award of contracts so that African governments are likely to do fealty when Chinese companies bid for Chinese government funded contracts. A recent report by The Economist suggests that in the next few years, China's growth rate could reach as high as 13% per annum. Industrial output has also increased by almost 50%, creating industrial overproduction in sectors like electronics, textiles and footwear. Rapid expansion has created the need for both import markets for energy and raw materials and export markets for Chinese manufacturers. Chinese companies have discovered opportunities in Africa's vast resources and untapped markets. In the 1990s Sino-African trade grew by nearly 700 per cent, a DFID China study has reported. Since then Sino-African trade has continued to grow at an exponential rate, with China displacing the UK as Africa's third largest trading partner behind the US and France. China accounts for nearly 20 per cent of Africa's total exports and more than half of Africa's exports to Asia.

From 1995 to 2004, Sino-African trade rose from about US\$4bn to US\$28bn. Within a year, trade rose sharply to nearly US\$40bn, more than twice Africa's trade with Japan which stood at US\$18bn for the same year. In 2005, China imported US\$21.1bn worth of goods from Africa while it exported US\$18.7 billion, showing a deficit of US\$2.4bn in its trade with Africa. Chinese officials point to this as indication of its commitment to helping generate surplus revenue to finance African development. But the deficit may largely be explained by China's voracious energy consumption and its emerging dependence on Africa's resources. Apart from a few very resource-rich countries, the majority of African countries have "mounting trade deficits" with China, according to the DFID China report. To ensure secure supplies of resources and export markets China is also keen on negotiating a free trade area with Africa and is already engaged in free trade talks with South Africa. Sino-African trade was expected to reach US\$100bn by 2010.

Chinese exports to Africa are composed mainly of machinery, transport equipment, textiles, apparels, footwear, and other manufactured materials while crude oil and raw materials dominate Africa's exports to China. Figure 2 shows the composition of Africa's exports to China in 2005, while the share of major African exports in Chinese global imports nearly 70 per cent of total African imports were oil (US\$14.6bn), with iron ore (US\$741m), cotton (US\$677m), diamonds (US\$502m) and logs (US\$495m) together making up 11.4 per cent. Angola (US\$6.6bn) was the largest supplier of crude oil. By February 2006, Angola had surpassed Saudi Arabia as China's largest source of crude oil supplies. Other major crude oil exporters to China were Sudan (US\$2.6bn), Congo (US\$2.1bn), Equatorial Guinea (US\$1.4bn) and Libya (US\$0.96). The U.S. Energy Information Authority also suggests that Chinese refineries face capacity problems with the heavier crude oil from the Middle East. While Western powers have succeeded in encircling Latin America, the Middle East, Central Asia and Eastern Europe through a number of regional security arrangements, Africa remains strategically open and China may become even more dependent on African oil.

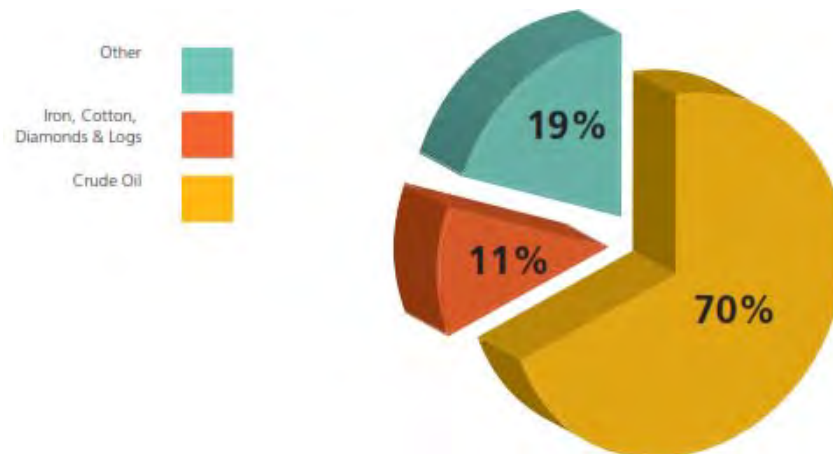


Figure 2 China's Imports from Africa

### 3.2 Investments

Since the 1980s, China has adopted a "going global" strategy that encourages Chinese companies to invest abroad to guarantee access to advanced technology, foreign exchange, energy and raw materials, and exports markets. The strategy also seeks to encourage Chinese firms to "cut their teeth" in international markets and enhance China's global power status. In Africa, Chinese state-owned and private companies have entered into a number of joint ventures with African national governments, state-owned corporations and private firms. Over 700 registered Chinese companies are reported to be operating in Africa. Beijing is encouraging Chinese companies to acquire and develop strategic oil and gas fields in Africa to mitigate anxiety about secure supplies of energy. It is also encouraging Chinese state-owned companies to source their own raw materials abroad, creating a strategic motivation to invest in Africa's resources. By 2005, the Bank's portfolio had tripled and its commercial operations outstripped those of its counterparts in the US, the UK and Japan. While the largest Chinese operations in Africa are in oil and gas exploration, development and production, there are growing investments in construction and engineering works, telecommunications, textile manufacturing and trading enterprises. At the opening of the 2006 Beijing Summit of the Forum on China-Africa Cooperation, President Hu announced a US\$5bn fund for further investments in Africa.

A significant feature of Chinese investments is that they can be found in countries and in projects considered too risky by Africa's traditional donors and investors. Chinese projects have sprung up in countries like Burundi with significant rebel activities. Conflict-shattered Sierra Leone, Liberia, Rwanda, and the Democratic Republic of Congo have all attracted Chinese investments. So have global pariahs like Sudan and Zimbabwe. The biggest recipients of Chinese investments in Africa have been the largest oil producers on the continent: Nigeria, Angola, Sudan, Equatorial Guinea, South Africa, Libya, Algeria and Guinea.

## 4 Opportunities and Exploration on Development Right

Today business emerge many opportunities and many areas are subjects to potential international joint cooperation between Africa and China. These strategic business opportunities have been described and some of them even explored through the establishment of Sino-African cooperation. To develop the visibility of these opportunities I will highlight especially some sectors.

### 4.1 Oil and gas

Through the three major state-owned Chinese corporations, the China National Petroleum Corporation (CNPC), the Chinese Petroleum and Chemical Corporation (Sinopec) and the China National Offshore Oil Corporation (CNOOC), China has been securing strategic assets and rights for exploration, development and production in Africa's petroleum industry. The three companies, the result of the reorganization of local state-owned companies in 1998, were initially set up to operate a range of local subsidiaries but have all gone international and become giant transnational corporations with vast resources to acquire overseas assets. In 2005, Sinopec and CNPC ranked 23 and 39 respectively among Global Fortune 500 Companies. Chinese oil companies have acquired stakes in 20 African countries. By May 2006, Angola had overtaken Saudi Arabia as the largest exporter of crude oil to China.

By late 2006, the Chinese government and CNPC had sunk US\$4bn into investments, development,

pipeline building and other operations in Sudan. CNPC has acquired a 40 per cent stake in the Greater Nile Petroleum Operating Company to exploit Sudanese oil deposits in the Muglad Basin. In Nigeria, CNOOC has acquired 45 per cent stake in the Alpo field for US\$2.27bn. CNOOC has also acquired 35 per cent of an exploration license for US\$60m. In Gabon, Total-Gabon and Sinopec signed an agreement in 2004 to supply China with one million tons of crude oil a year, making China the third largest consumer of Gabonese crude oil after the US and France.

#### **4.2 Non-oil resource extraction**

The extraction of non-oil resources like metal ores, bauxite essential in the electronics and electrical industries, and timber has also attracted Chinese investments in Africa. Over 60 per cent of Gabon's and a large part of Equatorial Guinea's timber production are purchased by China, which has raised concerns among some quarters as to the sustainability and length of life of this valuable rainforest. China is the world's largest consumer of copper and has invested US\$170 million in the Zambian copper mining sector. The Chambezi copper mine, which was purchased in 1999, is now its largest Chinese mining operation in Africa. China is also increasing its investments in cobalt and copper mines in the Democratic Republic of Congo and is exploring further supply sources from South and Namibia. In February 2008, the state owned Aluminum of China, or Chinalco spent 14bn dollars buying 9 % stake of Rio to disrupt its takeover by BHP. This was the largest amount of Chinese foreign investment. By that time, over last decade (Guinea) has become the largest Aluminum corporation in China with monopolistic power in price setting both down and up stream of them range of product.

#### **4.3 Infrastructure development**

Chinese development aid helps to finance infrastructure projects, including road and railway rehabilitation, hydropower stations, stadiums, hospitals, bridge and schools. In 2005, Chinese companies had been contracted to 722 turn-key projects across Africa. By mid-2006, total China Eximbank concessional and non-concessional loans for infrastructural development in Africa, excluding projects in the petroleum and mining sectors, were US\$12.5bn, the World Bank has reported. Angola, Nigeria, Mozambique, Sudan and Zimbabwe account for over 80 per cent of these loans, and the power sector makes up about 40 per cent of total commitments, followed by "General" or multiple sector commitments (24 per cent), transport (20 per cent), telecom (12 per cent) and water (4 per cent). Concessional loans from the OECD for infrastructural development in Africa amounted to only US\$4bn in 2004, suggesting China may be providing greater support for the development of Africa's infrastructure than are the OECD. According to a Wall Street Journal report, Chinese companies have paved more than 80% of the main roads in Rwanda and almost all Africa. For a continent with poor infrastructure and limited intra-regional trade, such investments constitute a significant development and have the potential to boost trade among African countries.

In Ghana, Sino-Hydro, one of the largest Chinese hydropower engineering firms, has been contracted to build a US\$600m hydropower project financed largely by a Chinese government loan to solve the African country's cyclical power crisis, the Ghana News Agency has reported. Following the visit of President of Guinea and Nigerian in China, both governments reached an agreement with the Chinese government for a loan to part-finance the construction of a railway line.

#### **4.4 Telecommunications**

Africa is one of the fastest growing telecommunications markets in the world. The telecommunications industry in Africa is dominated by Western and South African companies like British Vodafone, France Telecom and South Africa's Vodacom and MTN. Recently, Chinese transnational companies like the Zhong Xing Telecommunication Equipment Company Ltd. (ZTE), China Mobile and the private multinational Huawei have made significant inroads. China Mobile tendered for a \$4m bid for Nasdaq-listed million International, which has subsidiaries in Chad, DRC, Ghana, Mauritius, Senegal, Sierra Leone and Tanzania, while Huawei has introduced telecommunication products at affordable prices to consumers in the entire continent. In Kenya, for example, the price of a fixed line has dropped by 65 per cent after Huawei helped Kenya Telecommunications procure Chinese digital equipment.

### **5 Challenges and Implications**

As we know any business, at any place involves risk taking, also present challenges that have to be overcome anytime. This Principle applies to a Sino-African context especially regarding to a type of venture or cooperation the current research is dealing with. Through China's presence in Africa is driven by economic self-interest, both Africa and its traditional development partners stand to benefit from

Sino-Africa relations. But it also raises major policy challenges for African governments and international donors. Although facts mixed with other geographical, cultural and political considerations that make it more difficult to understand even to establish and to manage.

In practices IJV's are common in the oil, gas and mining sector or industry, even the studies show that  $\frac{3}{4}$  of those cooperation are based on cross border. Chinese government and companies are prepared to invest in high-risk countries, including countries like Burundi with active rebel groups. In many such conflict-affected countries a great proportion of the population is grateful to see new schools, roads, railway lines and stadiums springing up from the debris of war. In post-war Sierra Leone, Chinese aid is financing a range of projects to strengthen the machinery of government and the national security apparatus. A new office block, parliament buildings and a new military headquarters for the government of Sierra Leone have been built with generous support from the Chinese government, while Chinese companies have invested in a sugar plant and a tractor factory, which are providing jobs for the local population. Not every African is singing a lyrical ballad to the Chinese presence, however. Nana Benneh, an African banker who has observed the impact of Chinese operations on his clients' activities in Ghana, South Africa and some other African countries, offered a lachrymal paean: "Chinese exports provide cheaper access to more goods and services. This is good for the well-being of the people; in the long-term this is bad for Africa because it destroys local manufacturing capabilities and competitiveness. At home in Africa, there is growing resentment that cheap Chinese imports are killing local manufacturing possibilities. In Zimbabwe and South Africa, there have been protests against cheap clothing imported from China. Accusations of intellectual property theft by Chinese companies also spread to electrical and other industries.

In a speech at the Royal Institute of International Affairs (Chatham House) in London, President of Ghana and currently Chairman of the African Union, John Kufuor praised the Chinese for their development assistance to Africa but expressed concern about Chinese labor deployment in Africa, which limits opportunities for the transfer of skills and technology. According to researcher, it is estimated that nearly 90 per cent of the labor force employed in Chinese construction projects in Africa are Chinese. The deployment of Chinese labor in Africa reduces the potential positive effects of Chinese investments on household incomes in Africa. This has led to accusations of Chinese predation. There are concerns that because of Chinese aid practices, Western donor governments and the international financial institutions are losing strategic influence in Africa and with it their ability to continue to press for important initiatives on governance, fiscal probity and transparency. China's economic footprint in Africa has caused waves in Western capitals, institutions and the media. The international community's concerns about the Chinese presence in Africa range from preserving normative cosmopolitan ideals such as the protection of human rights, political freedoms and the environment to fears about diminishing Western political and material influence in Africa. As with the local responses, international views are mixed, though there is a preponderance of a negative perception about Chinese activities in Africa.

## 6 Conclusion

The recent Chinese move into Africa is driven by China's desperate need to find oil and industrial raw materials to feed its resource-guzzling and world's fastest growing economy, as well as untapped export markets to address industrial overproduction. China is pursuing strategic commercial targeting in Africa, building a fortress of near monophony in resource-rich countries isolated by the international community and competing out Western governments and companies in countries that were previously comfortable turf for the West. China has leverage over Western competitors because it makes no value demands with its aid and investments and provides generous support for the expansion of Chinese companies into overseas markets, an expansion critical to China's security interests and self-perception as an emerging global power.

The Chinese also have a long-term view of their relations with Africa and readily accept small margins to advance national interests and nurture a potentially large consumer market for the future. Africa has therefore become a strategic training ground for Chinese companies. Chinese presence in Africa is also good public relations for Africa. Chinese activities in Africa are enervating, and generating interest among, otherwise uninterested and disinterested investment communities in the West and may crowd in significant new investments for Africa. Among major stakeholders, China's economic profile in Africa has however produced a "mixed bag" of effects and responses. African government officials are gratified that their ailing economies are being bolstered by high Chinese demand for their resource

exports and large investments in infrastructure and other critical sectors long neglected by Western donors. On the whole, however, the majority of Africans believe China can have a positive or negative influence on Africa's development in the long-run.

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# Research on Problems and Countermeasures of Chinese Local Universities in the Strategic Alliance of Industry-University-Research Institute

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**Abstract:** Cooperation of industry, universities and research institutes is the major achievement of educational reform under the new circumstances in China. As a high level of this new model, the strategic alliance of the three parties is the inevitable approach to technological advancement and scientific innovation. It not only integrates all the advantages in environment and resource in universities, enterprise and research institute but also reflects the combination of theory and research with practice and demand. Therefore through the research method of data analysis, this paper investigates in depth the imbalance in academic strength, fund, degree of concern, discipline setting and team construction between local colleges and universities affiliated to central government and ministry. The above mentioned factors are basic causes for the difficulties confronting local universities along their way of cooperation with industry. On this basis this paper proposes a countermeasure which mainly includes the construction of improved academic team motivation mechanism, effective evaluation system and right approach for corporation.

**Key words:** Local universities; Strategic alliance of industry, University and research institute; Structure model; Countermeasures

## 1 Introduction

In terms of the university-industry corporation model in China, Peichu Chen and Meiceng Tu (2007) summarize the corporation model in China into two models from the perspective of corporation alliance construction, namely cooperative research and development, cooperative entity. Recently Gongwen Shi and Yingming Xiang (2011) take the practice model of innovation talent training in Central South University as an example and categorize the corporation model into five types. They are university internal corporation model, enterprise-university corporation model, joint cultivation model, achievement industrialized model and teaching base model.

In terms of the evaluation system of industry, education and academy, Bonaccorsi (1994) put forward to the evaluation index with the core elements of product quantity, research staff numbers and academic achievement numbers. Tomas Hellstrom and Merle Jacob (1999) think that the evaluation system should include fertility, reach and financial success etc. Via the analysis of management process, Zahra and George (2002) thinks the core index should include the numbers of patent, new product from corporation technology, new product in research and development, net profit margin.

However, there are some deficiencies in the present research. Firstly, for the object of study, present researches are based on the investigation on the enterprises in economically developed areas, ministry-affiliated or Project 211 universities and prestigious academic institute. The specific study on the central and western regions, local colleges and medium or small institute are scarce, so is the complete evaluation measurement index system for these areas. Secondly, for the research orientation, present researches mostly emphasize technology and patent transfer more than talent cultivation. They focus the technology support, but ignore intellectual support from the aspects of enterprise management, strategic planning, and risk control by the universalities and research institute. The writer for this paper will compare different universities, search for the bottleneck problems with the local universities' construction of the strategic alliance of industry, education and academy, and suggest some solutions.

## 2 Analyses of the Problems in the Local Universities' Construction of the Strategic Alliance of Industry, University and Research Institute (SALURI)

Now universities administrated by local government account for more than 85% in China. They play increasingly important role for the development of local economy. Thus how to integrate and

coordinate local universities with local economy is worth discussing.

### 2.1 Comparison of SALURI development in different universities

Local universities account for a large proportion in Chinese education system and plays increasingly important role in social development. But they are not granted deserved attention and become disadvantaged in higher education group. On the contrary the central government or ministry affiliated universities take core position in the construction of SALURI owing to resource distribution priority in research strength, fund investment and geographic advantage.

#### 2.1.1 Comparison of scientific research strength

The quantity and quality of researching faculty is the foundation for university’s sustainable development, which symbolize the academic power and play the leading role in the development of SALURI. Universities with faculties of high professional title and level can better interact with industry. They can timely transplant the technological advantage of universities into enterprises to speed technology innovation and facilitate the increase of profit and competitive edge. This research will present the talent advantage of central government and ministry affiliated universities merely by illustrating the university faculty’s professional title.

**Table 1 Faculty Professional Title in Chinese Universities**

	Teaching staff					Staff in research institute
	professor	associate professor	lecturer	teaching assistant	no title	
1. universities affiliated to central government of ministry	41152	59106	62772	8720	3456	20788
including: Ministry of Education	33928	47676	49656	5976	2616	16436
other Ministry	7224	11430	13116	2744	840	4352
2. local universities	85061	262785	374820	166691	42190	11176
including: education department	73849	191380	272398	102037	25197	10050
other department	11212	71405	102422	64654	16993	1126
3. private universities	22339	55334	79346	55688	23667	500

(Source: Ministry of Education Web site statistics)

Table 1 clearly shows that local universities (85061; 262785) are at an advantage compared with central government and ministry affiliated universities (41152; 59106) in terms of professor and associate professor numbers. But it’s due to the large number of local universities. If compared by absolute percentage, the number of professor in each local university is averagely 54, associate professor 167. This figure is far lower than that of 73 central government and ministry affiliated universities (464 and 653 respectively). It shows that the big gap of quality and quantity between local universities and central government and ministry affiliated university is a major factor leading to imbalance of SALURI distribution.

#### 2.1.2 Comparison of fund investment

Due to variation in investment statistics, this research applies the figure for investment in research and development by *National Science and Technology Funds Statistics Bulletin in 2010*. The total fund for R&D in 2010 is 706260 million Yuan, in which 518550 million Yuan is for various enterprises, 118640 million Yuan is for government affiliated research institute, 59730 million Yuan is for universities. The correspondent proportion is enterprise 73.4%, government affiliated research institute 16.8%, and universities 8.5%. This figure shows enterprises’ leading role in technology innovation is increasingly steady with the deepening of innovation system construction. On the other hand the universities in China are divided into two types, central government and ministry affiliated and local government administrated, there is a big difference in obtaining the enterprise sponsored funds. For example, in 2008 central government and ministry affiliated universities obtain 42460 million Yuan as academic funds in which 15450 million Yuan is from enterprises. But the total fund for the large number of local universities is 23900 million Yuan in which 8970 million Yuan is from enterprises. The disparity is very far.

#### 2.1.3 Comparison of geographic distribution

Due to the imbalance of economic development between east and west region in China and the distribution difference in university of various types, central government and ministry affiliated

universities mostly are located in east China, while local universities are mostly located in middle and west part. This results in diversity of difficulty degree in the construction of SALURI. This research uses 2000-2010 CDI (Comprehensive Development Index, including five indexes: economic development, livelihood improvement, social development, ecological construction and technological innovation) to illustrate the influence of regional development variation on R&D funds. This CDI is from China Statistical Society and based on CDI compiling program. Take 2010 as an example, the economic development indexes in the East, Northeast, Central region and West are 73.21%、63.04%、61.33% and 55.54% respectively; livelihood improvement indexes are 73.21%、63.04%、61.33% and 55.54% respectively; social development indexes are 67.32%、68.28%、66.93% and 66.12% respectively; ecological construction indexes are 65.90%、54.52%、57.73% and 55.31% respectively; technological innovation indexes are 38.37%、15.16%、14.72% and 13.54% respectively.

The variation in CDI causes the inclination of R&D fund apparently to development region. *National Science and Technology Funds Statistics Bulletin in 2010* shows that in 2010 there are 6 provinces whose R&D fund is beyond 300 million Yuan. They are Jiangsu, Beijing, Guangdong, Shandong, Zhejiang and Shanghai. Their R&D funds amount to 413650 million Yuan in total, account to 58.6% of the total national fund. 7 provinces whose ratio of R&D to GDP reach or exceed the national average are Beijing, Shanghai, Shaanxi, Jiangsu, Zhejiang and Guangdong. Among them only Shaanxi is located in Mid-west part. The other six provinces are mostly located in east coastal region. East regions have more powerful economy and considerable scientific and technological innovation resources. Mid-west regions are backward owing to historical and geographical reasons. The universities in Mid-west regions, especially local universities have great difficulty in obtaining R&D fund.

## **2.2 Bottleneck problems in the construction of SALURI in local universities**

The cooperation of industry, university and research institute is deeply influenced by social development. The cooperation model experienced the following stages: from formal contract relationship management, technology transfer office, informal technology consulting to today's SALURI promoted by relevant government departments, led by major enterprises, and based on universities. Local universities of large number and wide distribution should become the think-tank and propeller of local economic and social development. But various causes prevent the SALURI from serving local development.

### **2.2.1 Inadequate attention**

Due to different educational philosophy, central government and ministry affiliated universities are more willing to construct SALURI with enterprises to obtain the cutting-edge technological information, meanwhile to strengthen the academic achievement transfer based on market demand, which in turn propel the steady advancement of research level in universities. Although local universities are the main force to serve local economy, the training of application type talents becomes the major task owing to geographical and regional particularity. As a result local universities are mostly confined to daily teaching. They emphasize to impart knowledge and train career skills since these are regarded as major approach to serve local economic development, but neglect that project can promote research and development, that R&D propel application and that application can drive industry. They neglect the following tasks, such as optimizing local development environment by technology transfer, advising enterprise' management and operation, offering reference for government' policy. Moreover they do not assist enterprises to improve core competition and lead local economical and social development which ought to be their main task.

### **2.2.2 Academic team establishment backwardness**

Firstly, academic team in local universities lack core leading figure.

Academic leaders are the original impetus and spiritual pillar of the entire group. The academic leaders in local universities are generally trained by themselves. They lack effective communication with outside and less capable to know the demand of market and enterprises timely. So their corporation of industry, education and academy is somehow passive. The local universities are generally located in middle or west underdeveloped region and unattractive to high level talent. Moreover their personnel recruitment system is not perfectly established, which makes the local universities both unable recruit talent and keep talent.

Secondly, academic team is not stable.

As a group, academic team not only provides basic conditions for the construction of SALURI, but also builds a practice platform for team members. National and international relevant researches show that every university academic team has a life circle, namely integration phrase, growing phrase,

maturity phrase and split phrase.

Integration phrase mainly includes two-way selection of academic and market demand, preliminary construction of team and member identity, association establishment with enterprises etc. Growing phrase follows the preliminary approval of academic achievement by market and enterprises. It means further narrowing down the focus of research orientation and enhancement of the cohesion, coordination of internal contradictions, stabilizing team members to form an institutionalized normalized pattern. Based on the development of growing phrase, maturity phrase comes with more widely accepted academic achievement, rising popularity and credibility, more normalized management. After a period of development comes the split phrase. Some academic rookies grow mature enough to lead new research. The original team is divided into two or more new teams to broaden the overall academic level. This helps SALURI further advance towards multi-disciplinary and high-level direction.

On the whole, there are no essential differences between the life circle of local universities and central government or ministry affiliated universities. However, there's a fluctuation at growing phrase and split phrase.(shown in Figure 1)

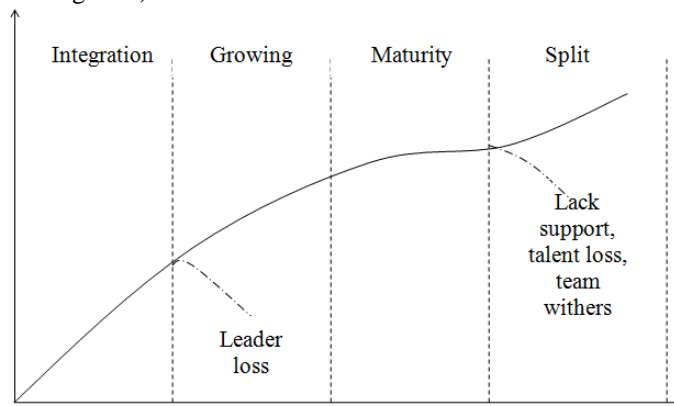


Figure 1 Life circle of academic team in local universities

At growing phrase, since local universities lack effective incentives to retain talents, the academic leader may turn to higher-level universities or more developed region after recognized by society. The loss of leaders makes the team exist in name only before maturity. At split phrase, local universities cannot support various disciplines and teams to coexist and develop due to shortage of talent and limited research conditions. Lack of basic personnel and material support makes the new team in malnutrition at early stage and unable to experience market test and gradually disappeared.

To sum up, because of the large economic differences between east and west in China and unequally resource distribution, local universities are at a disadvantage in the construction of SALURI. Meanwhile local universities' inadequate attention, the backwardness of discipline setting and academic team nurturing cause the low competitiveness and ineffectiveness of SALURI in serving local economy development. Therefore, local universities need not only adjust their policy on talent recruitment and team stabilization but also accurately grasp market opportunity and understand enterprises' demand so as to determine discipline setting orientation and make correct choice in SALURI approach.

### 3 Countermeasures for the Construction of SALURI of Local Universities

Although local universities are of great number and wide distribution in China, they fall behind the central government or ministry affiliated universities in many aspects. To avoid being marginalized in the construction of SALURI, local universities should give more consideration to SALURI and make use of such advantages as local status and familiarity with local situation. They should gradually transfer the management mechanism from merely teaching oriented goal to teaching and research paralleling. In this way the alliance will promote enterprise which in turn activates research, development and teaching.

#### 3.1 Establishing academic team incentive system

Local universities should incorporate the construction of academic team into university project system and allot special funds for award and sponsor the team. Based on detailed demonstration of its research plan and financial status, universities should grant special funds for its development and enforce its construction from the following three aspects.

Firstly, local universities should support academic team members to participate in national and

international academic and technological exchange. They can take various measures to send selected outstanding talent into famous universities, research institute or prestigious enterprises to study or research. In these ways they can establish exchange mechanism with national or international experts and scholars to continuously increase research ability.

Secondly, local universities should strengthen the cultivating and sponsoring academic leaders and create advantageous research and living environment. Meanwhile, on the basis of academic development task and local enterprise demand they should combine self-cultivation with external introduction by recruiting academic leaders both at home and abroad. All these efforts aim to forming a middle aged or young academic team with professional advantages, disciplines complement and high innovation ability.

In the team the leader regularly assess the team members under the leader centralized responsibility system. Out of the team the local universities is responsible for assembling the corporation party and external experts assess the academic leader’s performance and organization capacity periodically.

Thirdly, local universities should establish favorable management mechanism for academic team development, in which the boundary between colleges and disciplines are broken and a cross-college and cross-discipline research platform is built. In this way teachers of different major and level can supplement and unite for team development. Salary, allowance and bonus for research and innovation should be bound and allotted in accordance with labor and contribution within the team. With the maturity and more achievement commercialized and market-oriented management model and stock system reform should be introduced and tried out. A self-improvement mechanism is gradually formed by accumulating experience.

**3.2 Constructing effective SALURI evaluation system**

An effective evaluation system is the criterion to quantify the performance of SALURI. It provides importance guidance for studying the advantages and disadvantages in corporation and makes the future plan. The previous research on the SALURI evaluation system in China put more emphasis on the corporation effect and made overall assessment by regarding the provider—universities and research institutes and the demand side—enterprises as a whole. There was no special evaluation system for assessing the research, teaching, talent cultivation, etc in the universities. The lack of utility evaluation offers no help to the improvement of universities mechanism. Therefore it is especially important to establish a set of evaluation system especially for universities.

In order to evaluate the performance of SALURI from the perspective of local universities, this paper first makes a comprehensive study on the researches both at home and abroad. Considering that local universities pay equal attention to teaching and researches with a close contact to local economic development, this paper constructed a evaluation model by mainly choosing seven indexes, namely academic team building (x1) , technological achievement (x2) , students cultivation (x3) , resources utilization (x4) , coordinate distribution (x5) , contact with local enterprises (x6) , and others (x7) .

$$y=f(x_i), \quad i=1, 2, 3, \dots, 7$$

Each index entails a relevant index system (shown in table 2).

**Table 2 Matrix of SALURI evaluation index for local universities**

evaluation index	evaluation items	evaluation index	evaluation items
	1.whether academic team members’ structure rationalization is promoted		
	2.whetehr the team leader has outstanding achievement		1.utilizaiton efficiency of universities lab
team building: X <sub>1</sub>	3.whether the team’s popularity is increased	resources utilization: X <sub>4</sub>	2.utilization frequency of equipment and software
	4.whether the cohesion of the team is enhanced		3.integration of cross-discipline and cross-college talent
	5.whether the development of the team is steady		
	1.quantility of high quality academic papers		1.transparency of profit distribution
technological achievement: X <sub>2</sub>	2.number of corporative research project by universities and enterprises	coordinate distribution: X <sub>5</sub>	2.information exchange and disclosure in corporation
	3.patent number of technological achievement		3. incentive and constraint in corporation
	4.number of technology transfer		
			1.whether deepen the relationship with local economy

	1.number of students participating in the researches		2.whether participate in local policy making
students cultivation: $X_3$	2.number of academic achievement by students	contact with local enterprises: $X_6$	3.whether establish corporation with the local enterprises
	3. employment acceptance of students		4.whether participate in local economy management
	4.students' ability to adapt to society		5.whether provide technological support for local enterprises

evaluation index: 1.2.3.4.5., in  $X_1, X_6$ : 1=no, 5=great help; in  $X_2, X_3, X_4, X_5$ : 1=no, 5=comparatively good

In the evaluation process, local universities should combine internal self-evaluation with external evaluation. Internal evaluation group is composed of academic team leader, member and research and teaching department. External evaluation team includes the representatives from local government, enterprises and people of various social levels. The evaluation result should be objective and impartial enough to serve as a reliable reference for correct judgment of the effect and benefit of local university in SALURI.

### 3.3 Choosing right SALURI cooperation approach

Firstly SALURI is a full range of long term close corporation between universities, enterprises and research institutes based on the common strategic benefit. It fundamentally solves the problems in short-term loose and single SALURI cooperation. Secondly, SALURI is generally constructed on the basis of line of industry. It has an extensive and intensive corporation with the feature of creativity and integrity which can greatly promote the technological development in the industry. Local universities should actively take advantage of SALURI and consider individual characteristics and regional economic development features to develop cooperative way with specific target. (shown in Figure 2)

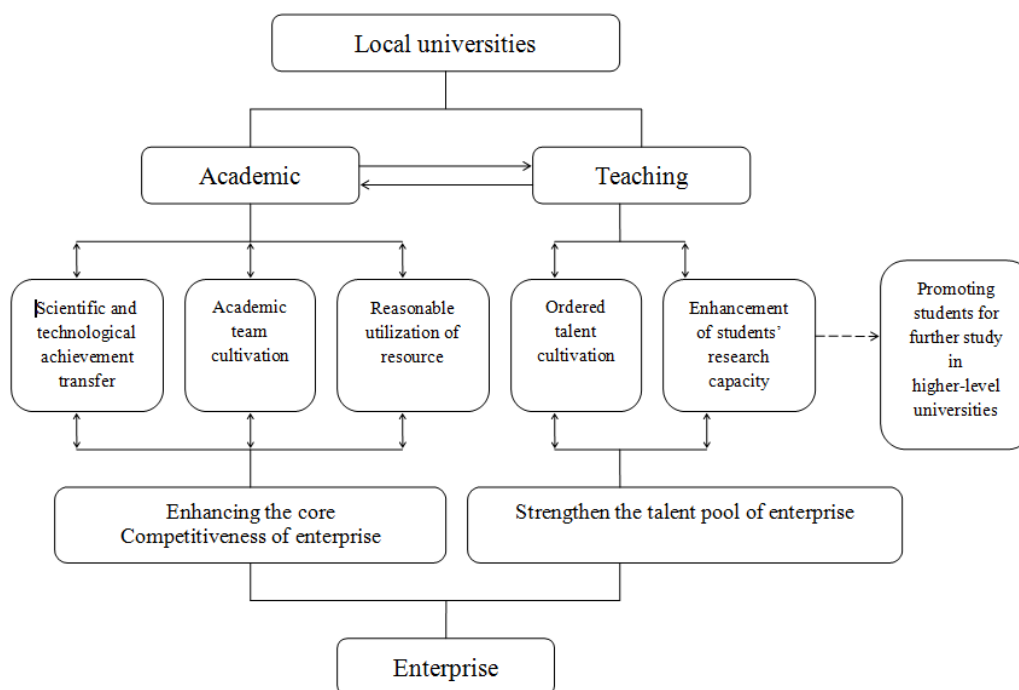
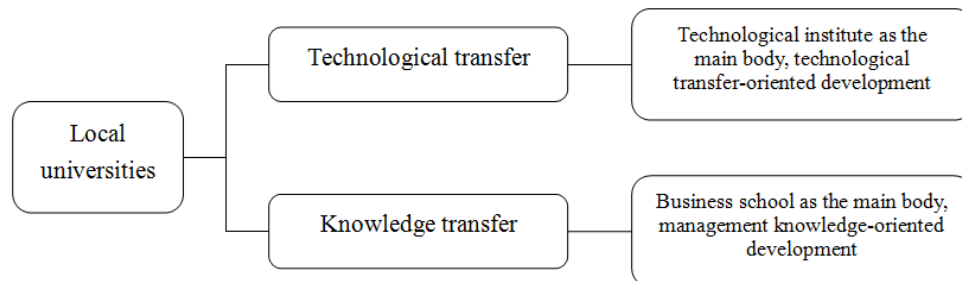


Figure 2 SALURI cooperative approach for local universities

On the whole, in the construction of SALURI, local universities should fully embody the concept of paralleling teaching and academic research. In terms of academic research, scientific and technological achievement transfer, academic team cultivation and internal reasonable utilization of resource should be given full importance. The academic achievement should conform to the practical local economic development and help the enterprise enhance the core competitiveness. Based on the benefit sharing principle of SALURI, local universities should invest the earning profit from the enterprise on teaching and academic research to promote the teaching and academic strength. In terms of teaching, local universities should make use of the local advantages, know timely the enterprise

need and cultivate ordered talent capable of management and technology skills. In the teaching process, local universities should give due consideration to students' academic ability with the goal of further study in higher level universities.

For the discipline setting characteristics in local universities and the defect of single corporation way of SALURI (namely technological achievement transfer) at present, this paper suggests a SALURI corporation notion which involves the equal emphasis of knowledge and technology transfer, joint effort of technological institute and business school. (shown in Figure 3)



**Figure 3 Local universities SALURI approach**

Because technological institutes have obvious advantage in technology and engineering field, they should continue the direction of their technological transfer. However in the construction of SALURI, on the premise of risk pooling universities should not simply regard themselves as the technology provider and neglect to consult the management of enterprises. Business schools have rich theoretical knowledge of operation and management; they lack opportunities to put these theories into practice. Therefore the combination of knowledge and technology transfer can not only conform to the original intention of converting advantage into profit, but also provide guidance for enterprise operation and management. It ought to be the best choice for a win-win approach for the corporation between enterprises and universities.

#### 4 Conclusion

With the rapid development of social economy, as the senior form of corporation between industry, education and research, SALURI is both the future development trend and inevitable choice for universities, enterprises and research institutes to sharing benefit and risks. Universities' role cannot be underestimated. Local universities with wide distribution and large number are important component in the construction of SALURI. Although the central government and ministry affiliated universities have an edge in funds, academic strength, team building, discipline setting and so on, local universities can also play their unique role in economic development. If local universities make best use of their familiarity with local situation, pay equal attention to research and teaching, shake off the yoke of single focus on teaching and take serving local economic development as core task, they will surely become the essential component in SALURI in China.

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## Relationship Networks and China's Increasing Presence in Brazil – Looking at Entrepreneurship and Cooperation

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**Abstract:** The study of interpersonal relationship networks belongs to a long and extensive multidisciplinary academic research field. Although the subject is not a new one, there has been an increase in the interest of the role of social networks in the business world. This article discusses a kind of network very peculiar to Chinese communities' way of life: the *Guanxi*. Ever more emigrating to countries of occidental culture, the Chinese bring with them their way of being and doing business to which the *Guanxi* is a significant cultural trait. Knowing this type of relationship increases the possibilities of success for those who intend to do business with the Chinese, both in Brazil and in China. The article encompasses a theoretical framework, exposing Chinese and Occidental theories about relationship networks, allowing a broad understanding of how *Guanxi* works. Interviews and the relevant analysis of their contents complement the exploratory and qualitative research.

**Key words:** Network; *Guanxi*; Entrepreneurship; Cooperation; Trust

### 1 Introduction

Regarding the international macroeconomic scenario, China already plays an influential role in markets such as Europe, Africa and Americas, which will be further increased in the next decades. In Latin America, China is one of the most important trade partners of countries like Brazil, Chile, Argentina and Peru, among others. Establishing, developing and maintaining commercial and investments long term links with the Chinese people is very important to achieve economic growth in a globalized and competitive market.

The table below shows the growth of Chinese Foreign Direct Investment<sup>[1]</sup> – FDI in Brazil since 2004, providing an insight of the relationship's strength between the two countries:

**Table 1 China Foreign Direct Investment (FDI) in Brazil US\$ millions**

Year	Value	% growth
2004	6.43	
2005	15.09	135%
2006	10.09	-33%
2007	51.13	407%
2008	22.38	-56%
2009	116.27	420%
2010	487.46	319%

Source: 2010–Statistical Bulletin of China's Outward Foreign Direct Investment

<http://english.mofcom.gov.cn/aarticle/statistic/foreigninvestment/201109/20110907742320.html>

Site: Posted in 2011-09-16 - Access in 04/25/2012

The amounts illustrated are the official data provided by the Ministry of Commerce People's Republic of China but, it is believed that the actual figures are much higher. Whereas the Chinese State-Owned Enterprise also sends resources from bases in other countries, data on Chinese FDI flows are distorted and underestimated.<sup>[2]</sup>

Many investments are made by Chinese investors already living in Brazil, besides investments made through the Huey, a kind of an investment consortium congregating private Chinese investors made outside the national or international financial systems. (SHENG, 2008<sup>[3]</sup>).

A report from the Brazil – China Business Council (Conselho Empresarial Brasil China – CEBC<sup>[4]</sup>) gives the information that billions of dollars in Chinese investments in Brazil are already confirmed in almost all Brazilian States, such as Bahia, Goias, Minas Gerais e São Paulo (CEBC, 2011, p.41).

China started the current cycle of economic expansion and the resulting increase of international relationship in the 1980's, following a new phase of economic opening and reformation inaugurated by



Deng Xiao Ping: These reforms caused a wave of foreign companies establishing operations in China and, at the same time, of Chinese companies establishing them abroad. The process generated an increase in the complexity of relationships, both from a commercial and a personal point of view, leading people and companies - in China and elsewhere - to study and understand the culture of countries and people with whom they would be establishing a new relationship.

Providing useful information about Chinese culture to Brazilian entrepreneurs to facilitate their business relationship with the Chinese will certainly increase their possibilities of achieving success in business endeavors in China. At the end of the day, other elements besides the economic are of fundamental importance in establishing long standing relationships.

Data from the Brazilian Ministry of Industry and Commerce (Ministério da Indústria Desenvolvimento e Comércio Exterior <sup>[5]</sup>) reveal that 24,908 Brazilian companies imported from China (51% of importing companies) and 2,643 Brazilian companies (12% of exporting companies) exported goods to China in 2011, showing how the commercial relationship between the two countries is thriving...

This article aims to generate awareness for the need to develop efforts to achieve mutual understanding and adaptation between cultures that are so different. Establishing a structured and conscious process to understand the Chinese culture is a critical factor to Brazilians entrepreneurs' success, especially considering the great differences between the two cultures. That process goes through recognizing that the Chinese culture is the result of more than 5,000 years of continuous written and lived history, built upon the organization of peasant communities.

The Republic of China was proclaimed in 1911 and brought more difficulties to Chinese people that in turn started a civil war. In the years that followed, the conflict between nationalists and communists, coupled with the Japanese invasion, lead many Chinese to immigrate to other countries in search for a better life.

Since 1949, when the Popular Republic of China was proclaimed, there has been a process of persecution of political opponents, especially members of middle income families, deemed as incompatible with the communist regime (VÉRAS, 2009, p. 187 <sup>[6]</sup>). That political persecution led many Chinese families to abandon and leave behind their goods and assets and flee the country, from Hong Kong or Taiwan.

Chinese society is constituted by many networks or webs. Threatened by hunger and starvation, mutual cooperation and collective spirit became the nation's founding values, also guaranteeing individual life and privacy. That specific way of relationship has been maintained by Chinese until today. It has been the main instrument used by those that need to flee the country and establish themselves abroad, most of the times in adverse conditions.

The objective of this article is to study the Chinese style of relationship – called Guanxi – as a determinant factor for immigrants that came to Brazil from 1940 on to achieve success in their private and professional ventures.

## 2 Theoretical Framework

Network: a word in fashion nowadays. It seems to explain almost everything related to human beings. But, at the end of the day, what is a network? There are many definitions, among which one common element is highlighted: it is the most ancient way of human beings relate to each other, so say the Chinese.

The study of interpersonal relationship networks has a long-term tradition in academic research, encompassing various disciplines like sociology, anthropology, organizational behavior and management. Although it is not a new issue, there is a growing interest in acknowledging the role of social networks related to business and other economic activities. Non-institutionalized business networks related to ethnical groups have been reducing international trade barriers and facilitating transnational flow of information and knowledge (GROSSMAN, 2010<sup>[7]</sup>). This article discusses the role and importance of interpersonal relationships – mutual assistance and reciprocity networks – as a driving force and guide of social and entrepreneurial actions in China and abroad.

BARNES (1987<sup>[8]</sup>) defined network as a structure of interpersonal concrete relationships that bond some individuals to others. All starts at family level: the first network to which someone belongs. After that, during the course of each individual's life, other relationships are established with various independent networks at the same time, with different objectives, indicating that networks have different functions and varying degrees of influence over each individual's life.

PINTO E JUNQUEIRA<sup>[9]</sup> maintain that:

“The existence of a network depends on a multiple and complex reality where acknowledging the other individual and the definition of common goals make possible the development of a social fabric.

That means that the social network is established from the interaction between individuals". (PINTO e JUNQUEIRA, 2009, p. 1.092).

Multiple and complex realities are a hint for the difficulties embedded in the task of understanding how networks work: networks are a changing context constantly adapting to new circumstances and events that occur at the same time. Concerning the operation of networks, CASTELLS (1999<sup>[10]</sup>) states that networks, as open structures, have unlimited capacity for expansion integrating new ties, provided that they share the same communication code such as values or performance goals.

MELUCCI (1999)<sup>[11]</sup> proposes an approach on networks' operations stating that networks, most of the time, are invisible, informal, tacit structures. They permeate all moments of social life but, they are virtually hidden from sight – they are the set of "hidden connections", an "underwater structure". Playing a fundamental role in one's life, people have many circles of relationships although they actually do not know how many of those circles exist or how to identify them. Usually people only see the network when they need it. (COSTA *et alli*, 2003)<sup>[12]</sup>.

Functions within the network are only performed through individuals' actions that are considered as social actions. According to WEBER, these are "actions oriented by other people's behavior" (WEBER, 2004<sup>[13]</sup>). That is, the social action occurs when individuals consider it meaningful to them and they behave accordingly to the group's expectations.

KRACKHARDT & HANSON (1993<sup>[14]</sup>) classify networks in trust networks, professional networks and communication networks. Trust networks are those that share "politically sensitive information" and are limited to a certain number of persons. They derive their major strength from trust and reciprocity.

Other important aspect considered by GRANOVETTER<sup>[15]</sup> is the notion of strength between the ties that link individuals to the network. The strength of a tie can be classified as strong, weak or absent, depending upon a combination of the amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services which characterize the tie:

Most intuitive notions of the 'strength' of an interpersonal tie should be satisfied by the following definition: the strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie. Each of these is somewhat independent of the other, though the set is obviously highly intracorrelated. Discussion of operational measures of and weights attaching to each of the four elements is postponed to future empirical studies. It is sufficient for the present purpose if most of us can agree, on a rough intuitive basis, whether a given tie is strong, weak, or absent. (GRANOVETTER, 1973, p1361)

To understand networks' operation usually one gets a snapshot of a network and interprets the relationship between ties. That results in a limited comprehension of the network related to a specific moment. However, it is useful to analyze how individuals behave in relation to the network, as the network plays a fundamental role especially at crucial moments in life.

## 2.1 Chinese network

Chinese people have a specific type of social relationship network, the *Guanxi*. Although it cannot be directly classified as a network in the way the term is defined in the Occidental world, it has a series of elements that can characterize that relationship as a network, as described below:

BELL (2000<sup>[16]</sup>) avoids the word network by advocating that *Guanxi* is a concept based on interpersonal connections encompassing "elements of both sharing and exchange. In the absence of the appropriate model, however, such processes are usually represented as exchange relations". He also shows that *Guanxi* network is a web of relationships that begins within family life and is expanded to other relationships established throughout a persons' life cycle.

Those interpersonal relationships have an important role in the Chinese system having its origin in Confucianism. In that system individual responsibilities are based on five important relationships: boss and subordinate, husband and wife, father and son, between brothers and between friends. SELIGMAN (1999<sup>[17]</sup>) suggests considering an imaginary circle around every Chinese. People around them will fall in one of two categories: inside or outside the circle. Inside the circle are relatives, neighbors, classmates, co-workers and those introduced by members of those groups. Some kind of *Guanxi* (relationship network) will be developed with individuals inside the circle and there will be some sort of commitment to them. Those outside the circle are unknown and there are not any obligations toward them. GROSSMAN (2010<sup>[7]</sup>) refers the following text presumably written by a Chinese scholar describing the system as a pattern of concentric circles expanding from the family as its core and having social connections as rays:

The whole ethnic Chinese network consists of numerous such circles. A Chinese businessman would seek a business partner from the nearest circle. The circle will expand as the business expands

(PENG, 2000, p.232 apud GROSSMAN, 2010).

In order to understand the intricate relationship process of *Guanxi*, it is necessary to comprehend the way it was structured over time.

Most of China population is still in rural areas even after the huge economic growth and industrialization of the latest decades, significantly working in agricultural or related activities<sup>1</sup>. Due to a less than favorable geographical environment, Chinese people always faced the challenge of sowing and harvesting food in enough quantity to cope with natural disasters, social calamities and to guarantee the survival of an ever increasing population using the same extension of land.

Although enduring dire constraints and a life marked by scarcity, HAIUA and BAKER (2008 [18]) show the contentment and tolerance existing even among the poorest Chinese communities. They say that behavior is based on the fundamental idea of being “connected”. A Chinese is never encouraged to think or act in an individualist fashion and is never treated as an isolated element. While Occidentals seem to be guided by the proposition “all are born equal”, Chinese believe that “all are born connected”. That belief means that everyone is always part of a network or social fabric. The referred authors conclude affirming that Chinese society is built by many nets and webs.

Reinforced by Confucianism the concept was enlarged to encompass loyalty to the country (e.g., government), respect for and obedience to teachers and superiors (e.g., parents and elder relatives). That mental conditioning leads to a strong sense of belonging and patriotism and fosters a behavior aimed at sharing. Those elements contribute to contentment. A person that is only preoccupied with his/her own accomplishments is constantly deemed “aggressive” and “selfish” instead of ambitious. In Chinese such individual is described as a “little self” or “xiaowo” but, if considered within the group he or she belongs is described as a “big self” or “daowo” (HAIUA and BAKER, 2008).

That environment marked by incessant struggle to survive was the cradle of *Guanxi*, as support from family was in many times not enough and an extension beyond family ties was requested from other village dwellers, co-workers or kinship clan. The Chinese methodology of coordinating the extension of support actions beyond the family cell is denominated *Guanxi* (BELL, 2000<sup>[16]</sup>).

*Guanxi* thus is related to the way Chinese act and establish rules aiming at enhancing support and maintaining cooperation commitments beyond family borders. It's a complex network system with millenary historical roots that in some moments was also used to oppose the State defending interests of the group, family or clan. Chinese peasant's survival, being it understood in physical, economic or social sense, always was underpinned by cooperation ties among individuals, especially family and community members. The system functioned even during the worst period of communist rule before the beginning of economic reforms in 1978. Nowadays *Guanxi* is used in various activities and still exerts its influence on Chinese individuals and their descendants' culture, both in business and family or personal relationships.

According to BELL (2000<sup>[16]</sup>) there are five *gang*<sup>2</sup> in Confucian logic that significantly influence the application of standards of behavior, each of them having an archetypal manifestation within domestic family. Those five cardinal relationships are called *wulun*. They are not “connections”. Structuring interpersonal relationships based on family *gang* is far apart from the instrumentalism that underpins the Occidental notion of “connections”. To say that *Guanxi* is not an instrumental relation (in its appropriate cultural expression) does not imply that *Guanxi* is not useful. Quite the opposite, *Guanxi* is worth much more than connections. In almost all cultures there is a *wu-lun* equivalent that guides relationship within the family. A special feature of Confucian thought is that *wu-lun* and its rules of conduct surpass the family group reaching all other forms of ethical relationship. As *wu-lun* rules are followed by other collectivities, family limits become surrounded by a large family-like structure of duty and responsibility. *Guanxi* is the term that expresses that mechanism (BELL, 2000).

Although occidental scholars consider reciprocity as fundamental for networks, BELL<sup>[16]</sup> uses it with reservations as it is not only a monetary exchange, but an element of group relationship's dynamic. Group is defined as a set of individuals with legitimate claims (denominated *fen*) for the sharing of certain resources. That sharing is done by means of *li* that can be translated as protocol, ritual or virtuous way of doing. The author claims that the performance of the whole group becomes effective, ordained and harmonic as a natural consequence of every person's actions based on the protocol (*li*) related to each one and to all. As a result of that appropriate way of acting contributions (*liwu*) happen accordingly

<sup>1</sup> According with 2010 CIA data urban China population is 47% of total population: <https://www.cia.gov/library/publications/the-world-factbook/geos/ch.html>, access in 07/19/2012.

<sup>2</sup> *Gang* is the term used to define the closest relationships : the ties between father and son, emperor and official, and husband and wife” (BELL, 2000 p.133)

to social position and relationships' hierarchy. Principles of balanced reciprocity are not compatible with this code of conduct. Therefore BELL distinguishes reciprocity notion explaining that "sharing contributions" or *zhanguang* means:

"[...] the sharing of (relative) good fortune. Hence the benefit to be gained from *liwu* is not reciprocal *liwu* but the possibility of *zhanguang*, a nonritual, nonroutine share under unpredictable circumstances (that may not ever arise)" (BELL, p. 135). The reason I argue against the term "reciprocity" in reference to the *liwu-zhanguang* relation is that reciprocity directs our attention to things, not to relations, as though *zhanguang* were the benefit to be gained from *liwu*. (BELL, 2000, p. 137)

In this way, BELL (2000) explains that strength and security of *Guanxi* for its members is the assurance that they can count on other members the moment it is needed. Participating in a network is a moral obligation that has to be complied with and not discussed. Chinese civilization cemented this value overtime and it is embedded in the relationships that are established.

In a further development of *Guanxi* concept, it can be said that it is an important informal relationship agreement between individuals that can be extended to business world and the set of relationships between companies and Chinese institutions. It implies social reciprocity and is based upon mutual feelings (*ganqing*) between two or more persons aiming at cultivating friendship and searching for personal benefits at the same time. In order to understand this concept more precisely it is necessary to point out to four essential terms concerning a broader concept of *Guanxi*: social relationships (*guanxi*), emotions (*ganqing*), favors (*renqing*) and face (*mianzi*) (NITSCH and DIEBEL, 2010<sup>[19]</sup>). *Guanxi* is established based on mutual trust. For the Chinese any important trust relationship between agents in the national economy is basically an issue of informal social relationships.

According to LUO YADONG<sup>[20]</sup> from Miami University the word *Guanxi* points to a kind of support through connections in order to guarantee favors in personal relationships. The term also expresses an elaborate and diffuse relationships' network which is cultivated by Chinese members' efforts and creativity. It has a code of ethics, it encompasses implicit mutual obligations, guarantees and understandings and it also rules Chinese individuals' actions regarding social relationships and long-term dealings (LUO, 2000<sup>[20]</sup>). The trust factor – *xinyon* in Chinese – plays a major role in building *Guanxi* relationship. Business is made with trustworthy individuals and there are no formal agreements or written rules. Those are applied if the business partner is not a family member or an element of the trust network.

SHENG (2008<sup>[3]</sup>) in his article about the experience of Chinese entrepreneurs in Brazil and the financial models based on relationships, relies on JACOBS (1979) to assert that, in the business scenarios, the stronger the *Guanxi* relationships, the greater are the chances for executives to reach their goals. If multiples *Guanxi* are interacting, these chances are also multiplied. JACOBS states (1979, p.262<sup>[21]</sup>) that:

Multi-stranded *Guanxi* bases increase the opportunities for social interaction. They also increase the feelings of commonality between the parties and make it easier for *ganqing* [appreciation] to occur. Multi-based *Guanxi* are closer and more consolidated and thus more resistant to deterioration than single-stranded *Guanxi*. Shared feelings make trust development easier.

According to SHENG (2008<sup>[3]</sup>) *Guanxi* has been viewed as one of the variables that explains success in development and growth of small and medium-size firms in China which, since economic reforms of 1978, have contributed to keep China's high rates of development and economic growth (GDP per capita medium annual increase of 8,1% ).

SHENG (2008<sup>[3]</sup>) explains that one of the success factors is that *Guanxi* through informal financing relieved lack of capital problems of Chinese small and mid-cap companies. Various *Guanxi* based financing models are used. Nevertheless is important to highlight that *Guanxi* can also be used in illegal transactions, bribe and cronyism. In this somber side of *Guanxi*, ways are found to circumvent the law, favoring members of society without merit considerations and encouraging the concession of favors at the expense of society. *Guanxi* network can be built wherever in the world to act in good or bad manner.

Differently from Occidental networking *Guanxi* involves other dimensions of social beings in building relationships. It takes time, living together and setting up trustful connections. It can be said that it represents some net worth. Building that network and counting on it can be a decisive factor for business as "doing business" is also making relationships. WEIDENBAUM and HUGHES (1996<sup>[22]</sup>) illustrate the issue with the example of relationship between ultramarine Chinese where, if any network member does not comply with ethical commitments his or her name is inscribed on the black list. This is much worse than being sued because the entire Chinese network will avoid doing business with the guilty member. On the other hand, transnational networks, for example, dealing with a specific foreign market can also contribute to consumer products' producers finding adequate distributors, assemblers, components' suppliers as well as helping investors to find joint-venture partnerships.

Networks create a circle of mandatory bonds and mutual help that can last for the whole life due to long-term return expectations. In his book *The Spirit of Chinese Capitalism*, REDDING (1993<sup>[23]</sup>) states:

Cooperation through personalistic networking appears not to have changed at all in structure or process, but simply in the identifying of appropriate members. *Guanxi* is as essential as it ever was. (Redding, 1993, p.236)

According to FERNANDEZ and LIU (2010<sup>[24]</sup>) *Guanxi* could be represented by a model of concentric circles: the core is formed by the family; the next layer is constituted by friends, coworkers and classmates. The external circle is made up by connections with precedent circles, i.e., by *Guanxi* of *Guanxi*. In the family circle loyalty and trust are fundamental elements and reciprocity is not mandatory. Reciprocity is stronger in the second circle – friends, coworkers and classmates – but not necessarily immediate. Favors' reciprocity will come in an appropriate occasion. In the external circle – *Guanxi* derived of inner circles – reciprocity is expected and as a general rule immediately. The strength that binds *Guanxi* together is the threat of exclusion. (FERNANDEZ and LIU, 2010).

### 3 Data and Methodology

#### 3.1 Historical background

It's important to present a brief timeline of Chinese immigrants coming to Brazil, in order to point out that there were various immigration flows having different characteristics and specific contexts.

The first records of Chinese immigration to Brazil go back to King Dom João VI in the beginning of Nineteenth century, when Portuguese Chancellor Count of Linhares designed a plan to bring Chinese to Brazil in order to satisfy the king's wishes of transforming Brazil in a tea supplier. It is believed that circa 300 Chinese came to Brazil at that time bringing tea seeds. (CHANG-SHENG<sup>[25]</sup>). Tea cultivation failed and Chinese immigration was only considered again as an alternative to slave labor by the occasion of slave abolition.

From then few Chinese came to Brazil to work in farms but, not in significant number (CARVALHO, 2009<sup>[26]</sup>).

The second Chinese immigration wave took place from 1870 to 1883. CERVO (2011<sup>[27]</sup>) highlights that should be stressed the establishing of diplomatic relations with China as part of Brazilian efforts to expand foreign policy:

Establishing regular diplomatic relations with China by treaty of October 3, 1881. A diplomatic mission to China was defined in 1879 and was led by Eduardo Callado e Artur Silveira da Mota had as initial objective to promote a Chinese immigration flow to meet the requirements of farmers suffering from growing shortage of slave labor force and from insufficiency of European immigration. (CERVO, 2011, p. 147<sup>[27]</sup>).

Although there was an open communication channel between Brazil and China, Chinese immigration flow to Brazil was not big. The last official attempt of Companhia do Comércio e Imigração Chinesa to bring Chinese immigrants to Brazil took place in 1883 (CARVALHO, 2009, p.131<sup>[26]</sup>). In 1900, a Chinese group arriving in São Paulo already came with working agreements with farmers as a result of Qing government – the last dynasty – actions to curb abuses against Chinese immigrants.

The major flow of Chinese immigration to Brazil occurred in the period from 1949 on, after the Communist Revolution of Mao Tse Tung and foundation of Popular Republic of China which led to a Chinese Diaspora in search of better opportunities in other countries including Brazil. This article is focused on Chinese immigrants coming to Brazil after 1950.

#### 3.2 Methodology

This article was written based on results of an exploratory research qualitative method with a case study, in which Chinese immigrants living in Brazil were interviewed (YIN, 2003<sup>[28]</sup>). YIN describes case study as “an empirical research that investigates a contemporaneous event in its real life context”. YIN also considers being valid a specific case study in the following situation:

“One rational form for a single case is when it represents the critical case in testing a well-formulated theory. The theory has specified a clear set of propositions as well as the circumstances within which the propositions are believed to be true”. (YIN, 2003, p. 40<sup>[28]</sup>)

The method consisted in performing a correlation between *Guanxi* and networks' theoretical fundamentals in order to identify the theoretical elements that are present in interviewees' experience. The content analysis method was used to analyze interview's content. That method is defined by BARDIN (2008<sup>[29]</sup>) as a set of communication's analysis techniques. According to LAKATOS and MARCONI

(1999 [30]) content’s analysis technique allows the content analysis of books, magazines, newspapers, speeches and personal documents as journals, interviews among others.

**3.3 Sample**

It is very difficult to gain access to Chinese individuals especially the elders and when the main purpose is to talk about their personal lives. For this article, Chinese individuals that came to Brazil after 1950 and are still living in the country were interviewed. Interviewees were selected based on referrals from other Chinese living in Brazil already connected to one of the authors. That was an example of a practical application of *Guanxi* as access to interviewees and their detailed narratives only was possible because of bonds of trust existing between some of them and one of the authors.

Nine persons were interviewed during six sessions. Nine interviewees represent a small portion of about 200 thousand Chinese living in Brazil. Nevertheless they have characteristics that make them significantly representative of the whole community: they come from different regions of China with specific local costumes and diverse dialects and their families have different professional occupations working in the industrial sector, commerce and services as well as performing religious and martial arts practices. All of them are members or co-founders of institutions whose objective is fostering business interchange and additionally preserving Chinese deeply rooted cultural heritage.

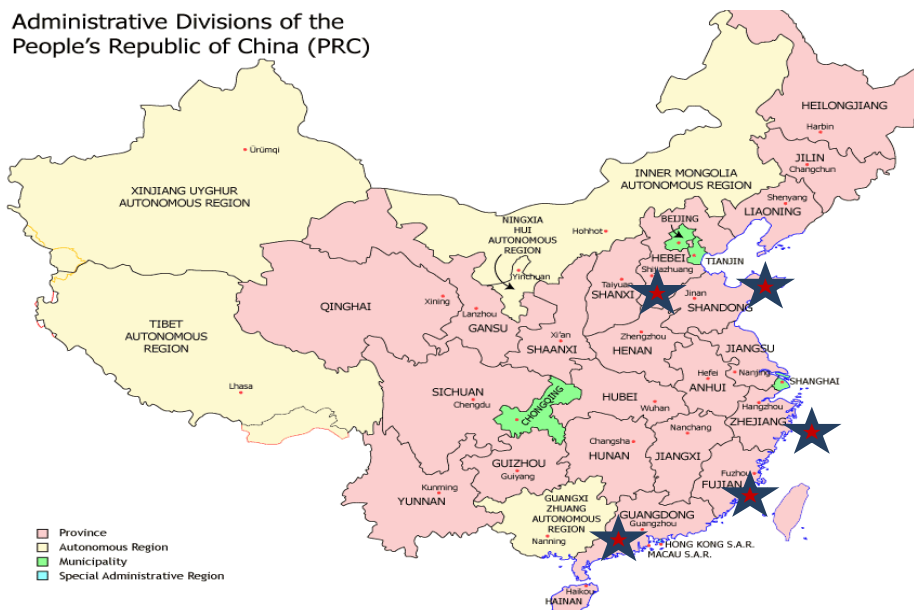
A brief script was elaborated for the interviews but, used only as a guide not disclosed to the interviewees that were free to talk following their emerging memories. Nevertheless, interviews were conducted to achieve the main target: obtaining details of their journey to Brazil, the development of their professional path after arriving in the country and the role played by *Guanxi* in these two very important aspects of Chinese immigrants’ life.

All interviews began with a “narrative generating issue” (FLICK, 2002, p. 110 [31]) in order to facilitate establishing a dialogue. The interviews were recorded and further transcribed. They were made in Portuguese with the possible participation of a son, daughter or a friend to help with the language only when necessary, as all interviewees have been living in Brazil for more than 20 years and are able to communicate in Portuguese in spite of some difficulties with the formal language.

The transcripts were analyzed after categorization of the answers in order to facilitate analysis and to make possible the presentation of the main points revealed by the interviews. Results are shown in the following section.

**4 The Interviews**

Interviewees came from various provinces of Popular Republic of China - Zhejiang, Hebei, Fujian, Guangdong e Shandong – scattered along Chinese east coast as showed in the following map:



**Figure 1 Administrative Division of the People's Republic of China**

Another aspect observed was the reason to emigrate often related to the difficulties of living in China - a very poor country in where the situation became more difficult after Japanese invasion in 1931 and political persecution during the regime installed by Mao Tse Tung in 1949. The exceptions in this case are made for two interviewees that came during the Cultural Revolution initiated in 1966.

The situation is described by some interviewees:

*Because things were very bad; in the middle of a war how you can sow or harvest? It was impossible; there was war every year; people running out, in caves, to save themselves (Interviewee 4)*

*At that time China was an underdeveloped country, feudalist, one war after another; thus it was a practically finished (devastated) country, made poor; so, leaving it was a dream of thousands of Chinese that wished to leave the country” (Interviewee 3).*

All interviewees came from big families of farmers or merchants. That situation is made clear by interviewee number 1:

*...at that time, as it was a small plot of land, a lot of people were relatives or friends, then, you know, one gives reference to the other and so on, and many people went to France, or go to the Netherlands. Then, today in France there are more than 20 thousand fellow citizens there, in the Netherlands there are more than 10 thousand, in Italy 20 thousand, and in Spain more than 80 thousand. So adding up there are a total of 200 thousand people or more from my town outside China, outside my town, and there are 200 thousand people in my town, that is, half its population is outside China” (Interviewee 1)*

All interviewees had important family ties with Chinese that had already immigrated to Brazil. They were helped with transportation (air or ship tickets, documents, passport, visa), with food and lodging in Hong Kong (exit door from China) and also with their reception when arriving at Brazil, hosting the newcomers and helping to get the first occupation. All had support from their families and their connections in Brazil, exception made for one interviewee whose parent had already immigrated to the United States and promoted the son's trip to Brazil as a step to a further meeting with his father in the United States. This interviewee had support from a Chinese middleman in Brazil paid by his father but, as he was charmed by Brazil, he decided to definitely establish himself in the country.

*During revolution and war you didn't have documents; you had to use connections, referrals as well as advice and orientation from other people.*

*He needed money and he didn't have it. After hours the church mate called, gave him an envelope, he opened that envelope and there was the Money his family needed to pay for the tickets to come. Then they came to the border that had to be crossed, there were acquainted people there, on both sides, which brought him and the customs' officers pretended not to see them and the whole family could pass (Interviewee 4)*

Another deposition clearly shows that when a Chinese immigrant succeeds, he or she brings other family members to Brazil:

*... My grandfather came, after that my father came, after came my brother and then came me and my mother. Then, for instance, I marry X; X starts to bring her family here; my brother married my sister-in-law and she already wanted to bring her mother, her brother, so, I mean, family starts to grow and grow. Thus, friend always brings friend, relative brings relative and in this way they grow stronger, creating even more roots. (Interviewee 3).*

*They are like ants, all, one goes out and calls for the others. One comes here, sees that there is hope and goes back there, searching. Chinese maybe have that, what you called, a culture of one calling for the other, helping. When my aunt came here there was already another Chinese.... (Interviewee 5).*

Even having a profession in China, many Chinese immigrants started from scratch a new career in Brazil taking lower paid jobs and doing whatever was available at the moment. They worked at pastry shops, they walked through the streets selling lace handcraft, and they made small slippers and ornaments for Christmas' decoration at home. Taking an immigrant couple as an example, he an engineer who came to work as a draftsman at an automobile wheel industry and she, a university professor, who became an English private teacher being paid below her qualification. But they still manufactured Christmas ornaments to increase family income. Two priests welcomed by Brazilian Catholic Church were the exceptions.

*Here, when I was nine, ten years old, I was already working to help my parents; my elder brothers were also working and studying. For that reason my eldest brother is already gone. There are four left and we had to survive and we worked almost all the time besides school, the spare time was used to make slippers.*

*At that time there were many pastry shops that needed people to do the job. When Chinese came they didn't speak Portuguese, wages were very low, we worked too much, that's because it was a low*

*paid job, workers were not registered and pastry shops' owners needed people. As they couldn't hire Brazilians they hired fellow citizens. And then, fellow citizens started his life that way. (Interviewee 7).*

Reports show family union and support together with community and Catholic Church support as leveraging their capacity to cope with difficulties.

*My uncles left (Honk Kong) and came to Brazil. They said to my father: "look, if you want to come here, you can come because we are here and it's much better than Hong Kong". Then my father said: "OK..., but how can we go to Brazil?"*

*Money came, brothers sold things, pooled and gave money and he bought a one way ticket for the entire family. He hasn't got the money for the return tickets"*

*My father came here and first thing was overwhelming difficulty, the only relatives they had were my uncles that lived here" (Interviewee 4).*

*That means, they are people that came in a dire situation and they helped one another survived and followed different paths...*

*... In each ship came 10, 15 families... each family that came was backup, supported and they sought one another and Church was the best place for that task. At that time people convened at the church with that feelings, with no intentions, no one was thinking of getting rich, no one thinking about ideology, everybody was seeking for support.*

*When people go outside their mother land the safest thing is getting support, I don't know if you understand, if you went through this. (Interviewee 4).*

*When you are an outsider, that means, you don't have a network or connections, and then it really becomes more difficult. You want to succeed, is evident; you got the means, of course. The temple is a good place, you go to pray together, talk about Buddhism; you go to the association to talk about the relation Brazil-China, you want to contribute with it, yes, but I want to say something: it is always proved by actions and not by your behavior (Interviewee 3).*

The speech of Interviewee 3 makes clear that is not enough going to church or to the association to establish a network connection. It is necessary to act in a way that proves your good nature and that gains other members' trust. That aspect is clear in the following observation from the same Interviewee:

*Trust is not bought, one has to conquer it, and then always through your actions and behavior you will prove that you are a person of good nature, that you are a trustworthy person. So, usually people talk: "Chinese are suspicious..." but, once you are trusted you can get everything, I think that's the way it happens. (Interviewee 3).*

Two were the immigrants' main sources of financial resources: hard work combined with minimal consumption and loans provided by their fellow citizens to start commercial ventures.

*They do that kind of consortium... it's not a kind of consortium, I have to use a more precise word, it's a pyramid scheme. Everybody pools some money, 24 installments. If each one gives 1,000 Reais it adds up to 24,000 Reais. 24,000 are enough to support something. And then the group gives this 24,000. First month it goes to me, second month to you, and so on and so forth.*

*[HUEI] Everybody used and everybody needed. It works even today. If one needs he does a HUEI with his partner. Today I need capital, let's say 100,000 Reais and I don't have those 100,000. So, I know S..., I know you, I know another person and then I organize the consortium.*

*... It's Always that: if one needs money, consortium. (Interviewee 7).*

*... Those that came from Shanghai don't use it much but, the peasant, the Taiwanese, use very much. That's very common: if you need money, you go to the consortium. (Interviewee 1).*

Another example of community support is shown by the statement of two interviewees; priests that, at a point in time, needed to build a church and sought support from Chinese immigrants, of which only 30% were catholic:

*In the mean time I had found that land plot but, without money, how to do it? And then, one day, I thought: "How can we make all this?" So, I thought of collecting money from the community and start doing it.*

*... At the time that would cost 68 million of Cruzeiros. [The priests requested a monthly installment to the donors]. Paid in installments, every month I went there to collect a little. At the end of two years I had got 113 million. With 68 million [they paid the land plot] and the rest went to the construction.*

*...money came from [Chinese] community. Back inside there is list, that list shows the contribution of the benefactors. (Interviewees 8 and 9).*

In spite of initial activities, badly paid and characterized by intense workload, all of them in some way achieved a stable financial situation. All of them developed commercial or industrial activities becoming successful entrepreneurs, exception made to a couple that was able to perform the same



activities they made in China. Although supported by the Brazilian Catholic Church, the priests had the initiative of structuring the Chinese Church in Brazil that was successful with the support of the community in spite of difficulties.

An example of entrepreneurship is given by the father of interviewee 1 that came to Brazil to build a factory to his uncle. He worked for him during one year after which he decided to quit because he perceived that he would not be able to bring his family in the short-term. He then started a new import and export venture supported by a friend (a rich Chinese immigrant) that lent him the money. He had come up with new opportunity in a different sector while working in his uncle business.

*He quit and needed to bring his family but, he already brought lace, tablecloth and china from China that than came as luggage. And then the rich man says to him. "OK, I trust you because I know you are competent. I will not lend you 2,000 but, I'll lend you 10,000, therefore you can buy your merchandise and everything but, I have a share. 10% are mine. So, my dad made the calculations and saw it worked. He bought the merchandise and his uncle bundled the goods and sort of make importing official. At the same time he started to deal with ... [other business] and was able to export. And then he began to work like this.*

Other example of Chinese entrepreneurship is shown by interviewee 3 depositions that went through ups and downs ever coming back to business:

*[After a period when the entire family sold Chinese lace on the streets...]. And then things evolved and [his father] bought the first [store] for my mother, after that my big brother bought another one, and then I also bought, and then my kid brother bought. So, we bought four stores in the same mall selling almost equal things. From there, long after I had made money from the store I set up a company and I bought things at auctions, I made a lot of money. I was young, thirty and something. (Interviewee 3)*

After losing everything in a business setback he came back to business:

*And then, you know, and then I lost and came back selling on the streets not anymore Chinese lace but, selling perfumes, watches on the streets, so I got some money selling on the streets for 6 months and set up a company [electronic products], I started to import several products and now I'm importing machines [heavy equipment]. (Interviewee 3).*

Besides the material success achieved by the interviewees, they also had defined as their main target educating their children allowing them to enroll in the best universities. As a result, all their children graduated in excellent universities. Some depositions that reinforce the importance of education are shown below:

*As they came with nothing, most of them came with nothing; they gave education to their children: "you have to study". And then in the decades of 1950 and 1960, maybe 1965, you looked at the newspapers, looking for the college qualifying tests, and the best ranked students were all Chinese.*

*... Everybody has to qualify for USP, the parents said, as they didn't have money. "You go studying day and night and you will pass the qualifying test for USP because I can't pay for a private college and you, to have a future, will have to study". And they, the boys and girls studied day and night and in all areas, you can go there and see, the first three ranked students are all Chinese". (Interviewee 3).*

*... Precisely because Chinese families know how to value, during difficulties, everybody, it doesn't matter if he is a Christian or not, but she comes in a very difficult situation and here she can find abundance. Look, you have to study, you have to learn, you see, this is a wonderful country and there are children graduating from GV. Here in Getulio Vargas, in the 80's, from 100 students 50 were Orientals... That is Chinese blood. The best school, the best school. Everybody has to go to the best school. (Interviewee 4).*

Chinese in Brazil performed also other activities that were always connected with social functions like cultural and social centers and the church. Some of the interviewees and their descendants founded those institutions and others preside or have presided Brazil-China chambers of commerce. Presently there are more than 30 chambers of commerce founded by Chinese coming from various regions and that convened to get mutual support. Chambers are not subsidized and don't have ties with the government of Popular Republic of China. They are private initiatives aiming at fostering commercial, social and cultural interchange between immigrants and the regions they came from.

*There is always a cultural Chinese center and people go there when they come and are searching for business opportunities, a palace to live, where they can...*

*[the center] used to help those that first came. They all went to that cultural center (interviewee 1).*

*In truth those associations exist also to meeting people of the town, talking about the land, to remember and relieve nostalgia; one help each other, It's a sort of mutual help among the fellow citizens only. That's the reason for more than 40 associations. But, there is the Chinese Association of Brazil that*

*coordinates all those regional associations” (Interviewee 3).*

Finally, the most important aspect, the issue of networking among Chinese appears in various depositions making clear that being connected is essential and fundamental in their lives.

*...”Because they come from my land and so they come already connected; they are already part of the network” (interviewee 3).*

One of the interviewees clearly states the importance of trust in building strong connections and generating a new network tie, as already mentioned in “Theoretical Framework”:

*In China they always say: trust is not bought; trust is conquered. So you can see through various jobs and acts; you can see if a person deserves your trust or not.*

...

*And then the guy gives credit to you. They see that you don't have money and they have that cooperative spirit, for the sake of fellow citizenship, for the sake of the Chinese outside China. There were few Chinese here, you see, and when we saw a Chinese that still spoke Chinese we thought: He is like me; it looks like a friend, a relative. Immediately. Because it was very rare a Chinese meet another Chinese here in Sao Paulo. That is a kind of solidarity feeling to a fellow citizenship, because they have the same nationality. And then to talk on behalf of China becomes easier. Once trust is thus established it is spread to the whole family.(interviewee 3).*

There are two additional key elements for *Guanxi* operation: informality and the discipline of wrongful conduct by other network members:

*Ah, they don't fail. Because if you fail you lose your credit, you lose trust, you see... And then there has never been a contract, a sole note is valid. They gave you X, you keep the note, an informal notation. All is trust; all is a matter of trust.*

*So people that, for instance, did bad things, to someone, or some guy that is doing evil; those associations together can call him to see if anything can be done against those elements wrongdoings. And so it's a network, an association that defends Chinese community life's interests, but not only that, it also maintains the culture and the good customs of Chinese life. (Interviewee 3).*

## 5 Results

At the beginning, Chinese interviewed were reluctant. As one of them said, they are suspicious. After understanding the objective of the interviews, many felt at ease and ended telling many touching details of their lives. There was not any attempt to romanticize or circumvent difficult situations of life they had to tackle.

The interviewed Chinese showed some difficulty in understanding why to study *Guanxi*, as for them “being connected” seems to be a fundamental aspect of “living in the world”. The existential issue and the role of network in their lives seem to be something inherent to life and not mentally elaborated. Relationship network seems to be considered a natural element of their lives. They ALWAYS can count on other people willing to help them at difficult moments. And they will do the same to help people needing their help. As far as family and close friends are concerned – the core of *Guanxi* concentric circles – that is a moral obligation (part of Chinese basic values) regulated by Confucianism.

Confucianism considers the family as the logical starting point of moral development (FERREIRA, 1968<sup>[32]</sup>). This important feature of Eastern Culture makes working in family easier as all the members are united to achieve a common goal, that is, to obtain financial stability. The interviewees do not show any kind of consumerism pressure from the children or their parents, all of them aiming at the same objective.

*Guanxi* is fundamental for people to set their professional activities in the market. Individuals help one another in getting a job and they do not care starting from the bottom, as they believe in the strength of their work and in discipline to achieve their goals.

*Guanxi* is established even when there is not a direct referral. There were two situations where a bond was created by the single fact that the individuals were Chinese and both were living in a new country. Help was offered without solicitation but, only after a probation period of daily interaction and the assertion that both parties were trustworthy. Even if help was not accepted, a bond was created and it can be activated in the future, if necessary.

This survey was motivated by the interest in knowing how Chinese immigrants were supported in Brazil by their networks and in how those networks worked. All the interviews revealed an entrepreneurial spirit and all individuals got over suffering, financial duress and the pain inherent to the situation of leaving their country. They arrived in a new and unknown land and were able to build their

careers and/or enterprises with results far beyond those that could have been imagined and no sign of regret or self-pity for the dire initial situations was perceived during the interviews.

*Guanxi* is not an entrepreneurial catalyst but, it was detected that it is a valuable instrument for those who want to start a new business, providing some facilities as prioritizing supplies, providing longer term credit and referral or appraisal to other businessmen. By means of *Guanxi* a series of complex commercial transactions could happen, notwithstanding the bureaucratic hurdles usually in place in a country like Brazil, waiving written agreements, formal guarantees, banking loans and many other conditions that an immigrant in the same situation of the researched Chinese could not cope with.

It is possible to understand the significant value of networks but, besides that, how they are established in all instances of life. For Brazilians doing business in China or with Chinese coming to Brazil it seems to be of paramount importance acknowledge that business for the Chinese are first of all relations. Relations to endure must be based on trustworthy “acts and attitudes” which take time to be proven credit worthy and longstanding. That is a very different custom from the Occidental short-term oriented, legalistic and formal tradition.

Investing in longstanding and mutual advantageous relationships between companies and entrepreneurs both Brazilian and Chinese assumes acknowledging those aspects which are determinant nevertheless intangible.

Since the last decade a growing number of Chinese companies has been establishing in Brazil. In the same way, an increasing number of Brazilian companies have been doing business with China. The crescent Chinese insertion in global markets and specifically in Brazilian market make even more important to understand Chinese approaching to business relationships. That understanding is fundamental to establish advantageous and longstanding business relationships.

Since the global economic crisis of 2008, China has been aiding economies in difficulties, including Latin America and Brazil. This is the key to explain the big resilience of that region so far. A Chinese slowdown can bring big difficulties to Brazilian entrepreneurs. Knowing how to establish trustworthy relationships based on mutual cooperation can be the key success factor to maintain Chinese and Brazilian companies dealing in harmony in the long run.

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## Research on Management Mode of the Scientific and Technological Innovation Platform

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**Abstract:** The existing research on scientific and technological innovation platform paid little attention to the influences of the game of the government, enterprises, universities and research institutes who construct it. This paper aims to study the management mode of the government-led scientific and technological innovation platform. At first the management characteristics and status are analyzed. Then the existing problems and causes are revealed. At last recommendations to optimize management mode of platform are proposed. Five suggestions are given to optimize the management mode.

**Key words:** Scientific and technological innovation platform; Management mode; Game; Optimization; Common technology

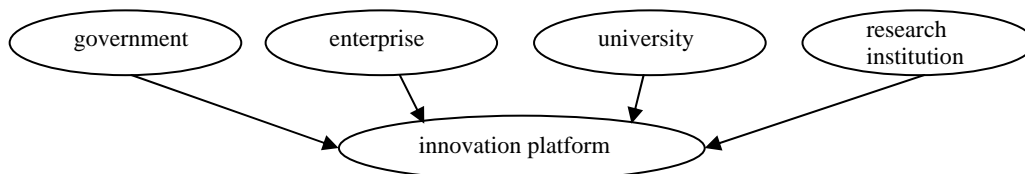
### 1 Introduction

Scientific and technological innovation platform (hereinafter referred to as innovation platform) emerges as innovation vector to solve the common technology needs of the industries. It is an important component of national innovation system and the element support system to serve the social scientific and technological progress and technological innovation. It will meet the common technologies needs of enterprises to some extent and can play an important role to enhance the competitiveness of national or regional industries. It will play a major role in promoting the development of the regional pillar industries.

Research joint venture (RJV) in Europe and the United States is a form of innovation platform as we concerned which is constructed by the government, universities, research institutes and enterprises (Y Caloghirou, S Ioannides, N S. Vonortas, 2003) collaborative R&D organizations. But most RJV are constructed by the enterprises, the related studies also focused on the form of R&D organization, which is only one type of RJV. Less attention was paid to the government-led innovation platform. The rise in building innovation platforms in China was from the 90s of last century, (mostly government-led), theory began to pay attention in recent years. There were the following two aspects about research on the management mode of innovation platform. First, it was to explore the ways of construction and organizational model of innovation platform based on common technology of industry from point of view of participants. Secondly, it was to design operating systems of platforms with multiple views. Although the theoretical study on the innovation platforms gradually increases, there is rare study on the influences of the management and development of the innovation platform caused by the game of the participants because of a late start. It's still lagged behind the practice of innovation platforms. This paper reveals the existing problems of innovation platforms based on in-depth analysis of the current status of the management model. Policy recommendations are provided for standardized management and it's helpful for construction and development of the innovation platforms in China.

### 2 Status, Problems and Causes of Innovation Platform Management Mode

There are diversified forms of organization about innovation platforms, but overall, 'government-enterprise-university-research institution' innovation platforms are a large proportion in all innovation platforms. Co-management by multiple management bodies is the main mode of these innovation platforms (figure 1). The contents about management are different with the main parties to manage. And there are differences in management style, too. Such management mode has its advantages, but there are coordination issues.



**Figure 1 The management structure of the innovation platform**

**2.1 Management status of the innovation platform management mode**

There are multiple management bodies on one innovation platform, the contents of the management are different. The management styles are different because of different management bodies.

**2.1.1 The management contents and ways of the government**

The government’s main role is to organize and communicate with investors, invest in the platform and create policy environment about the management of innovation platform, such as making the overall strategic plan for the development of innovation platform, designing the annual plan and budget for building innovation platform; managing application and approval, monitoring and inspecting the process of building, evaluating internal management system of innovation platform, coordinating between the leading construction unit with other participants and so on.

The management way of government is as follows. First, the platform is regarded as a public institution, but it is operated as an enterprise. On one hand, public services should be delivered by the innovation platform, on the other hand, it’s promoted to establish the market mechanism gradually and is asked to have the ability of self-survival and development. Second, policy environment is provided mostly by science and technology management department. From the practical point of view, the existing policies and regulations about establishing the innovation platform are more confined to science and technology management department. Third, the innovation platform is managed by many government departments. There is hardly cooperation about innovation platforms because of the diversification management of the government.

**2.1.2 The management contents and ways of the enterprise**

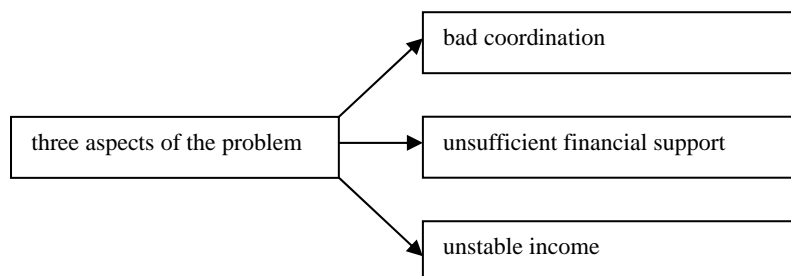
Enterprise is the main investor for the building of an innovation platform. Capital management is enterprises’ main job during the construction period of the innovation platform. After the completion of the innovation platform the major management task is the allocation of resources, convergence management of market operation and R&D, transformation of scientific and technological achievements. The way of an enterprise to manage depends on the company's position in the innovation platform. If the innovation platform is affiliated to the enterprise, the innovation platform will be integrated into the overall development of business plans, and the operators of the innovation platform will be selected, the performance of innovation platform will be monitored, revenue will be accessed and so on. Otherwise, there is a relatively loose contact between the innovation platform and companies. The purpose of the company is the access to common industrial technology.

**2.1.3 The management contents and ways of universities and research institutes**

There are two main aspects with management of universities and research institutes in innovation platform. One is to manage the inputs of the objects, such as asset management, including the shared use of research and development equipment, transfer and utilization of patents, technology, methods, information and other intangible assets. The second is to manage people who are delegated by universities and research institutes. It’s needed to determine standards for selecting talents, ways for personnel station, incentive and allocation mechanism.

The way to manage is relatively simple about universities and research institutes in innovation management platform. They are mainly involved in council decision-making, coordination with the government about development issues of innovation platform, management of intangible assets and tangible assets, assigned the management team to innovation platform and so on.

**2.2 Problems and causes with management in the innovation platform**



**Figure 2 The management problems of the innovation platform**

**2.2.1 Problems and causes about coordination**

First, the objectives and orientations of multi-management bodies are uncoordinated. As a leader in innovation platform construction, the government tends to make innovation platform provide common

technologies for the industry. Although universities and research institutes are public services, they continue to explore the marketization road under the present conditions of market economy and hope to get more market opportunities and project resources by innovation platform. Enterprises mainly ask for technical support. It can be seen that the objectives and orientations of the three are different. The difference would be reflected in the management mode of the innovation platforms (such as the location, business structure, incentive mechanism and the the distribution of benefits of the innovation platform, etc.). Thus the lack of coordinated management is on innovation platform.

Secondly, the government's multi-management is difficult to coordinate. Construction and development of the innovation platforms is in need of cooperation of financial, planning, land and resource ,fire and building departments. In recent years the innovation platforms developed rapidly. If the management of the government was not in place, it's likely to produce negative phenomenon which is not conducive to the development of scientific and technological progress as well as to the innovation platform, such as repeated construction, vicious competition, and waste of resources.

Again, company affiliated by innovation platform conflicts with other companies in the industry. It should be noticed that there is hidden problems when the innovation platform is affiliated to the dominant firm of the industry. The profitability nature of enterprises contradicts the nature of public service of the innovation platform. In the market economy, the business goal is to maximize profits. In order to achieve this goal it appears fierce competition among enterprises within the industry. Although innovation platform affiliated to company is asked to provide the public technical, technical disclosure of the business and technology fair use issues will inevitably be worried by other companies.

#### 2.2.2. Problems and causes about financial support

Financial support for innovation platform is difficult to meet the needs. Financial funds are invested in the projects of the innovation platform. But the project income is insufficient to cover the research costs. It affected the normal operation and sustainable development of innovation platforms. And R&D in projects is difficult to take into account the sharing of common and forward-looking technology. It is not conducive to industrial generic technology innovation.

#### 2.2.3. Problems and causes about obtaining stable income

There are three reasons for the innovation platform to obtain a bad stable income. First, the personnel structure of the innovation platform is irrational. As the management mode has not really been established, there still exists the phenomenon that technical personnel are valued and management talents were ignored in the personnel structure. It will influence the business development and overall operation. Secondly, the business model is difficult for the innovation platform to get stable income. Compared to enterprises who produce and sell products continuously and can get more stable income, research and development is fundamental survival for innovation platform, while the R&D activities are often based on the project and are non-continuous breakpoints state, and received income is not stable, so the development is hard and not smooth. Again, it is the dilemma to make R&D the main business to operate for innovation platform. The innovation platform is essentially a common technology research and development institutions with the public nature. But also it is given an arduous task to get the hematopoietic system by enterprise operation. It is beyond reality, because the public nature determines the inherent problems of unstable income for the innovation platform.

### 3 Ideas and Policy Recommendations to Optimize Innovation Platform Management Mode

Previous studies stated clear that promotion of the common technologies was impacted not only by market failures, but also by organizational failure. From the analysis of this article it can also be seen that inter-organization failure constrains to promote the development of common technologies. That means that it will make loss because of different objectives of the management bodies building the innovation platform. How to supply the generic technology effectively? That is the problem to be solved with the management mode.

#### 3.1 To establish mechanisms of loose management and free development

We propose that the government and the universities and research institutes should be concerned about the long-term development of the innovation platforms. Specific management functions of the government and the universities and research institutes should be weakened, and functions with supervision, performance appraisal and other services should be strengthened. The focus is on designing and making use of management system of the innovation platform. The innovation platform is operated

as an enterprise. So the management of the innovation platform is directly responsible to the council, rather than a particular administration body or a subordinate unit.

### **3.2 To establish mechanisms of recruitment and incentives of the core staff**

The main risks of the innovation platform are financial risk and reputation risk, and the government takes the main responsibility of the risk as an investor. From the sources of risks, the government is not the party to arise risk unless there is improper risk control; the universities and research institutes as parties to build the innovation platform, they will not take the initiative to create risks because of constraints of responsibility and moral. The risks are most likely to take place in the innovation platform itself. It's from the not due diligence team leader. To sum up, the key to improve management mode is the platform leader. The core is to manage the leader with a scientific and effective way. The scientific decision-making way is needed on mechanism of appointment and incentives.

### **3.3 To establish mechanisms of multiple coordination**

First, the relevant government departments perform their duties based on division of labor. The aim is to form a joint force to develop the innovation platform. It's needed to break down the situation of departmental isolation and low efficiency. It's to make plans and manage with a unified method with existing resources. The innovation platforms should be managed, directed and guided to the healthy development road with rational distribution of government resources,.

Second, the common technology must benefit the industrial enterprises fairly. The relevant rules about developing and using the common technology must be made. The aim is to benefit the majority of enterprises, rather than being a tool for monopolies for certain corporate.

Again, it is needed to establish coordination mechanisms between the innovation platforms. The purpose is to integrate the distributed innovation platform resources and make them share with the innovation platforms in order to set up better docking for the innovation platforms and the enterprises.

### **3.4 financial supports for the innovation platforms should be divided into two stages**

At the operational level, according to the principle of "best configuration of limited financial resources" it's suggested that the government change the way to support the innovation platforms in the constructing stage as primarily (or only means) practice in the past. The method is to adjust the policy orientation. It's to support the innovation platforms with fund from "start-up money" to "development fund". At the start-up stage, the government invests part of the capital into the innovation platform. If the innovation platform was in good working order after two to three years, the government invests will invest more capital into it.

### **3.5 Try to implement the "one platform, two systems" model**

It's suggested that two level institutions should be set up in the innovation platform. The first level is the administrative agent (registered at civil affairs bureau). It's still in the nature of the administrative units. The main task is to construct and operate the innovation platform. The second level is the enterprise institution (registered at bureau of industry and commerce). It is a subordinate enterprises founded by the innovation platform as a public platform. The main task is to construct and operate the venture platform (or transformation of platform). But two platforms are relatively independent, and the enterprise has independent legal person qualification and property rights.

## **4 Conclusion**

There are multiple management bodies on the innovation platform, and the contents of the management bodies are different. The management ways are also not the same with many management bodies. There are some problems with management modes. Such as coordination problem, insufficient financial support for the innovation platform, bad profitability functions and so on. It is needed to establish mechanisms of loose management and free development, to establish mechanisms of recruitment and incentives of core staff, to establish mechanisms of multiple coordination, to divide financial support for the innovation platform into two stages and try to implement the "one platform, two systems" model and so on.

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# Collaborative Innovation Ensues Innovation Through Pastiche

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**Abstract:** One of the means to address societal challenges in the European Union is through social innovation programs and through increased call for collaboration amongst public and private entities. This paper presents a theory that innovation through *pastiche* is an unacknowledged trend in the field of collaborative innovation. As suggested by the researcher, Living Labs are “a human-technology interaction innovation entity utilizing a mix of methods, tools and principles drawn from known disciplines (design, science, etc.), set in a real environment and in a locale/societal scale” for the purpose of social innovation and finding business opportunities. The researcher analyzed related publications of articles within 2005 – 2011 and analysis were made as a practice and not per Living Lab. The researcher concluded that collaborative innovation as observed in the Living Lab, results to a pastiche of best methods working together towards innovation with a collaborative consensus among multiple founding actors.

**Key words:** Collaborative innovation; Innovation through pastiche; Pastiche method; Living Lab

## 1 Introduction

Firms are now collaboratively innovating<sup>[1]</sup>, globally networking and public-private partnerships are becoming crucial elements in companies' innovation processes and in addressing environmental and societal challenges through user involvement and co-creation<sup>[2]</sup>. Societal challenges are considered to be “wicked problems”<sup>[3]</sup> arising from the social realm and needs to be addressed through social innovation. Social Innovation (SI) is “the process of inventing, securing support for, and implementing novel solutions to social needs and problems”<sup>[4]</sup>. Social Innovations then are “new ideas that meet unmet needs”<sup>[5]</sup>. Governments around the world now support SI through collaboration, e.g. Social Innovation Europe<sup>1</sup> (SIE – supported by European Commission) sponsors and presents the different initiatives of 32 countries; USA has the Office of Social Innovation and Civic Participation<sup>2</sup> (SICP) aimed at sponsoring and developing community solutions and new models of partnership; UK's Big Society Capital (BSC)<sup>3</sup> aims at “developing a strong, diverse and sustainable social investment market” enabling organizations to tackle social issues through social investment; and a more futuristic program by the European Commission's *Europe 2020 - Innovation Union Lab*, setting a goal for “more jobs, improved lives, better society”<sup>4</sup> with thirty action points to address. There are also initiatives by non-government organizations in cooperation with private firms such as China Social Innovation Foundation, The Young Foundation, Social Innovation China (SIC)<sup>5</sup> for meet up with entrepreneurs similar to TeD Talks which has different segments. What the trend suggests is that Social Innovation as well as inspirational platforms for innovation is regarded to be a collaborative endeavor, whereby the norm of top-down is supplemented with a bottom-up approach in the hope of mobilizing everybody.

*“The Bottomline is clear: Solutions to America's challenges are being developed every day at the grass roots - and government shouldn't be supplanting those efforts, it should be supporting those efforts.”*

~ President Barack Obama, 30th June 2009<sup>22</sup>

The researcher focused on the study was to elicit the methods used in a collaborative social innovation project. Methods are defined as procedures for data collection, evaluation or experimentation, idea elicitation and techniques utilized during the planning or execution of the project. The setting is the practice called “Living Lab” (LL). It was given preference due to the close affiliation and reputation in engaging a specific locale/society or a group of users or consumers, whereas compared to other innovation projects LL are more considered to be open to public.<sup>[6: 7]</sup> Innovation projects that are LLs were analyzed for

<sup>1</sup> SIE, started March 2011, <http://www.socialinnovationeurope.eu/>

<sup>2</sup> White House office of SICP, started August 2009, <http://www.whitehouse.gov/administration/eop/sicp>

<sup>3</sup> BSC, July 2011, <http://www.bigsocietycapital.com/>

<sup>4</sup> Innovation Union Lab, [http://ec.europa.eu/research/innovation-union/index\\_en.cfm?pg=intro](http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=intro)

<sup>5</sup> SIC, started March 2010, <http://socialinnovationmeetup.grou.ps/home>

stakeholders or partners involved in the project and the methods used. The results presented are part of a broader research regarding the Living Lab phenomenon previously studied by the researcher.

## 2 Literature Background

The discussion below presents collaborative innovation and its role in advancing societal issues, a discussion of mix of methods approach or innovation through pastiche method towards innovation, and comparing this to the LL setting. In a separate article by the researcher, Living Lab was defined as “a human-technology interaction innovation entity utilizing a mix of methods, tools and principles drawn from known disciplines (design, science, etc.) and set in a real environment and in a locale/societal scale. In addition, Living Lab operates in a “multi-” mode that is evident in its multi-stakeholder, and multi-discipline nature which eventually leads to a multi-method approach, and is often implemented multi-culturally for internationally collaborated Living project. The phenomenon is within the context of innovation and has multiple applications. Performing a keyword Google search on July 2012 for the keywords “mixed-method innovation” results to four links; while “pastiche method innovation” yields no result. However, a working article by Robert Porter Lynch entitled *Architecture of Collaborative Innovation* states that “Innovation” is a “fragmented pastiche of methods, allusions, processes, frameworks, tools, and techniques.” His observations resonated strongly with the researcher’s point of view; but whereas Lynch describes the situation, the researcher provides data to prove that Collaborative Innovation results to pastiche method for innovation

The manifestation of multiple stakeholders collaborating for innovation and usage of different methods during the LL project execution will be elaborated on this paper. With this in mind, discussion about collaborative innovation and social innovation requires some elaboration. Collaborative innovation is enabled by the lowered cost for doing collaborative research and development<sup>[8]</sup>, and growth of network relationships among businesses. Collaborative Innovation with customers is increasingly essential for development of new products and services<sup>9</sup>. The term Collaborative Innovation is a common lingo in businesses but there is little research highlighting this in the field of Social Innovation which is a paradox, because it is pretty much the norm in dealing with societal challenges. Christensen, et al.<sup>[10]</sup> suggest supporting catalytic innovations, defined as “low-cost and simple but useful services for people whom traditional social sector organizations ignore” for a progressive society. Social innovation has been increasingly shorthand for the approach public-private partnership (PPP) and adds more to it by transforming public services by tapping people in the private sector, especially social entrepreneurs<sup>1</sup>. The continuing paradigm shift has also influenced the firms to do collaborative innovation with customers.<sup>[9; 11]</sup>

Initiated projects engaging on a specific locale users has chosen the “Living Lab” concept as a means for social innovation in rural areas<sup>[12]</sup> to serve social needs in a sustainable manner<sup>[12]</sup>. Arguably there is no denying that Living Lab tries to tackle societal issues collaboratively, however researchers produced few research describing methods used in operating a collaborative innovation in the field of social innovation. Literature regarding the principle of mixed method research approach is suggested to have a “methodological pluralism or eclecticism, resulting to a superior research as oppose to mono-method research.”<sup>[13]</sup> Pastiche method for innovation as a metaphor representing the varied carefully amalgamated methods used in an innovation project, to avoid confusion the mixed-method approach was not used as the term has strong links to research but lacks the affiliation with innovation. The researcher will try to explain that collaborative innovation thrives due to the openness to assimilate other forms of methods or “innovation through pastiche” and one example for this study is the Living Lab.

## 3 Data and Methodology

Data was mainly drawn from articles through comprehensive search on scholarly works engines. The qualitative nature of the data gathering was helped by qualitative analysis of Strauss and Corbin<sup>[14; 15]</sup>. The articles are a rich source of data for the study as it elicits all the methods used to carry out the project. The researcher evaluated relevant scholarly publications and conference material between the years 2005 to 2011. Published articles included scientific journals, IT journal, conference paper proceedings, and books. The articles were gathered on November 2011 to December 2011 and resulted to 268 articles, using ACM, EBSCO, Google scholar, IEEE Digital Explore Library, Mendeley, Piccarta,

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<sup>1</sup>The Economist, 12 August, 2010; Social innovation: Let's hear those ideas; <http://www.economist.com/node/16789766>

Sage Journals, Science Direct, Springerlink, Taylor and Francis and Web of Knowledge. The search has been exhaustive and was representative of the publications. The keywords used were “living lab approach, living lab, living labs, living laboratories, and living laboratory”. Methods are defined as procedures for data collection, evaluation or experimentation, idea elicitation and methods utilized during the project operation and execution.

**3.1 Data Analysis**

The methods that were used hand-in-hand are: principles from grounded theory approach as explained by<sup>[14]</sup>, and qualitative data analysis <sup>[16]</sup>. Grounded Theory is defined as theory derived from data systematically gathered and analyzed through the research process. Techniques, such as open coding, memoing, axial coding, theoretical sampling and others were used to come up with a sound analysis of the phenomenon. Memoing is defined as the process of the researcher recording analysis, thoughts, interpretations, questions and directions for further data collection. Coding is done by identifying the most important keywords with in the paragraph or block of data. It can be done in vivo (informants/interviewees words), or in concept (the researchers own interpretation). In generating concepts, questions such as who?, why?, how?, why this way? and when?, were asked while looking at the data<sup>15</sup>.

**4 Results**

The discussion of the results will be in two parts one for the general results from the 64 LL which were defined with the aid of the 107 articles combined together with the interpretations of the eight interviews.

**4.1 Utilized methods/techniques**

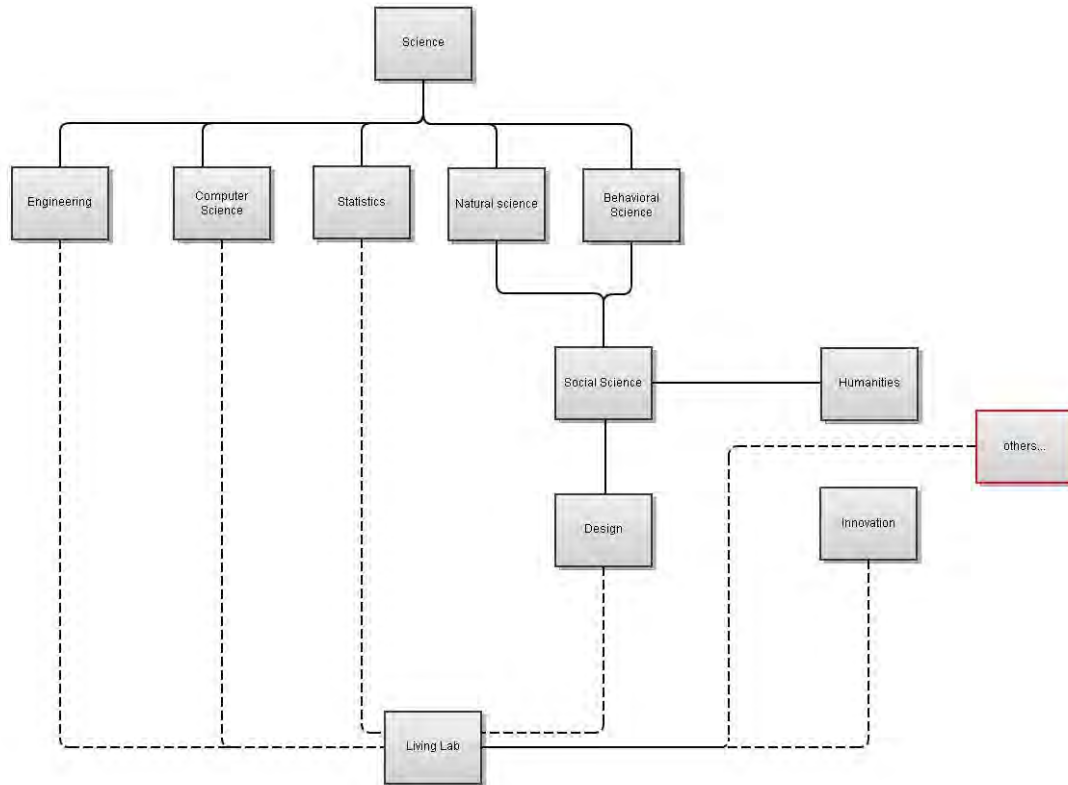
Based on the data Living Lab as a practice utilized the 62 methods (shown in Figure 1) *e.g.* action research, agile method software development, analogies, anticipation analysis, association techniques, basic design, etc. It spans across different disciplines which would represent the LL practice. Under the 62 methods, thirteen different frameworks (but categorized as one) or method were created and applied by other LLs. The same trend has been observed by the participants of the interview. Interview participants expressed some methods working together with the project framework/method being deployed.

**Figure 1 Methods from Varied Disciplines**

Methods	
Action Research	Idea cards
Agile method software development	Interview
Analogies	Market Research
Anticipation Analysis	Media blitz
Association techniques	Narratives
Basic Design	Observation
Blog	Participatory design
Brainstorming	Persona
Branding	Problem Definition
Card sorting	Procedure/Process redesign
Census	Project management
Clustering	Prototype
Co-creation	Qualitative research
Contextualized Model/Scheme/Framework - 13	Questionnaire
Data Gathering	Scenario
Design-oriented research	Self Documenting Methods
Diaries	Seminars
Discussions	Service Experience Engineering
Domestication framework	Service Oriented Architecture
Electronic data collection	Software Development
Empirical Setting	Storyboards
Ethnographic Methods	Survey
Experience Application Research	Systematic Pluralism
Experience Sampling Method	Test methods
Experimentation	Trend Analysis
Extreme programming sessions	Unified Modeling Methodology
Feedback	Use Case
Field Study	Use Case Driven
Focus Group	User-centered design methods
Human computer reaction	Visual Mind Map
Workshops	Visual narratives

**4.2 Traced methods/techniques**

These methods were traced to be from various disciplines from Behavioral Science, Design, ICT, Management, Marketing, Patent, Scientific, Social Science, and Statistics as depicted in Figure 2. Although there is an unsettled debate as to what constitutes whether LL is a method or a concept, there is a consensus about the importance of users' role in a LL project. The researcher wants to add in the discourse that LL is a concept which utilizes the "art of pastiche" as shown in the data. These characteristics can be one of the tacit factors that make LL appealing to researchers and innovation firms.



**Figure 2 Origin of Methods Drawn by Living Lab Practitioners**

As the Living Lab concept grows in its applications, it is the researcher's opinion that the number of discipline method will grow as well, which is a sign that innovation through pastiche is the way forward in collaborative innovation. Having said this, the data also suggests that collaborative innovation in the LL setting is evidenced by the number of partners involved or expected to be involved. The founding partners are normally composed of university and affiliate research firm, government, and private firm, and the public: University acting as host organization of the project in cooperation an affiliate research organization that provides researchers who act as facilitator; European Commission, national government or local government for funding and co-innovation on public policy and local development; private firms that provide technology expertise, products or services which is being tested, and monetary investments; and crucial to this partnership is the group of users, or consumers, to whom ideas will be sourced and validated, and hopefully trigger researchers for inspirations and discoveries with the feedback and behavior of users or consumers.

The diversity of used methods and the flexibility of the practitioners to incorporate different methods can be attributed to the partners or actors involved in establishing the projects. Reflected in Figure 3, most of the LL projects had a minimum of four actors from different classifications: university, users, private - profit and nonprofit oriented and active participation and funding from government. Actors from across different disciplines and interested parties are incorporated during the establishment of the innovation project.

**Figure 3 Living Lab Actors**

#	Name of Living Lab	# of Identified Actors
1	Social Media Experience and Design Lab	2
2	Botnia LL	3
3	ELLIOT (Experiential Living Labs for the Internet of Things)	3
4	e-Paper living lab	3
5	HP living lab - Andhra Pradesh	3
6	PlaceLab	3
7	UBI - Pilot 2009	3
8	Accessible digital home	4
9	Coffee Comer LL	4
10	Cudillero Living Lab	4
11	Digital participatory design living lab	4
12	Future Care Lab	4
13	FZI Living Lab AAL	4
14	DFKI Competence Center for Ambient Assisted Living	5
15	eStadium living lab	5
16	Future retail center living lab	5
17	ITAIDE living lab	5
18	LivingLab4Carers	5
19	MyHealth@Age	5
20	Porvoo Campus living lab	5
21	Design creativity city living lab	6
22	i-City living lab	6
23	Living Labs in south africa	6
24	Mocatour living lab	6
25	Owela - Open Web Lab	6
26	Record online living lab	6
27	Agri-Food	7
28	Airport Living Lab - Arlanda, Sweden	7
29	Amsterdam living lab	7
30	Corelab	7
31	Halmstad living lab	7
32	Intelligent Life Scheme	7
33	RLABS - Reconstructed living lab	7
34	ROMAS-project	7
35	Save energy project	7
36	Sölund Living Lab	7
37	Taiwan living lab	7
38	Trentino as a Lab (TasLab)	7
39	T-Seniority - proposed	7
40	Aristoteles LL	8
41	Bremen assisted living lab	8
42	Czech living lab	8
43	Helsinki-Tallinn Euregio	8
44	Sekhukhune Rural living lab	8
45	Siyakhula living lab	8
46	Turku Archipelago Living Lab - Archipelabo	8
47	Asuke Project	9
48	Ecospace	9
49	Cross Border Cooperative Pilots (Crocopil)	10
50	Digital Madeira Living Lab	10
51	maXi project	10
52	Schwechat - Ambient Assisted living lab	10
53	Beer Living Lab	11
54	Freeband & Kenniswijk living lab	11
55	Homokháti living Lab	11
56	Paper living lab	11
57	Food living lab	12
58	Mediterranean living lab	12
59	Skagen Living lab	12
60	Singa laboratory	13
61	Drug living lab	14
62	Sustainable Construction Living Lab (SCLL)	14
63	C@R II	16
64	wearIT@work project	20

### 4.3 Social Innovation in Europe

The data suggests that most of the Living Lab activities are concentrated in Europe; a result of the national and European level sponsorship and encouragement of innovation. Possible usage of technology, open data or information technology and future opportunities in societal issues are seen as key in solving the current EU challenges. However encouragement and sponsorship has been expanded to a more concrete measurement by the European Commission: Horizon 2020 endorsement of an Innovation Union Lab which is job creation<sup>1</sup> and focuses on societal challenges facing EU society<sup>2</sup>, *e.g.* health, clean energy and transport. Scaling up of the innovation efforts can be supported by the proposition of the researcher that on the different innovation projects innovation method from different disciplines and sectors should be encouraged to have a dialogue and increased interaction as these results into a more inspiring and can possibly trigger unexpected innovation. Whereas ICT innovation clusters and business incubators emphasize profit goals, social innovation projects such as LL has it as an underlying goal but has high emphasis on public co-creation of solution enabled by the close interaction of different partners for social issues and it is achieved by the rich perspective and methods that is put into action during the project execution.

## 5 Conclusion

The researcher observed the phenomenon of “innovation through pastiche” by studying the LL concept. Living Lab researchers and practitioners create a neutral environment for collaborative innovation. Proof of success of the LL collaborative innovation is still in question and can be a focus of future researchers but what is visible is the growing practice and research interest evidenced by the number of previously executed and ongoing projects such as Stanford’s Living Lab<sup>3</sup> promoting sustainable food, and the upcoming University of Leiden’s The Hague Living Lab<sup>4</sup> for peace and justice. The focus of the research concept is quite varied and challenging such as eHealth - aging well, ambient assisted living; rural inclusion and development; cross border trading; public eServices; and others. Challenges that require small scale projects for developing solutions, by putting users/consumers in the center of the social innovation projects with the support of different parties. The scaling of solution testing then enables the project to be performed in a societal scale.

Different parties mean different perspectives, manners of execution and means of execution of a project; and so the main focus of this paper to suggest that Innovation through pastiche is an observable trend in the LL practice and should be fostered. The diversity of methods coming together to form a specific innovation project is a tricky proposition but the convergence<sup>[17]</sup> of practices and methods from different fields and disciplines have been observed in media organizations<sup>[18]</sup>, learning<sup>[19]</sup> and increasingly in social innovation. Although social innovation can be done by social entrepreneurs, performing it collaboratively is a more structured alternative to making sense of the social challenges that Europe and the rest of the world is facing.

In summary the researcher was able to provide a basic understanding on the trend of pastiche in the form of utilized method of research concept through Living Labs. For further research, innovation through pastiche for social innovation can be a win-win situation, as it empowers each of the founding actors of the project and allows an exchange of ideas. However, further research is needed not on the perspective of an entire practice but on the micro-level (per collaborative project) specializing on social innovation for profit or non-profit. Articles are a rich source of data but additional interviews can be performed to get more data as well as participating in an ongoing project. The current research only provides an optimistic perspective of the pastiche method in collaborative projects, but does not discuss the dark side of a collaborative organization such as Living Labs as well as the method of “pastiche” in collaborative projects. Elaborate research on the different categories of social issues that can be performed collaboratively and the mechanics involved in executing the project will further develop the knowledge regarding mix of methods approach. The manifestation and increased call for collaboration and dialogue between different parties can also be researched with a focus on the “collaborative culture” in the field of emerging ICT innovations for social innovation. Collaborative innovation in the setting of social innovation is fast becoming a culture rather than an isolated case of tackling social issues; it can be

<sup>1</sup> Innovation Union Lab, [http://ec.europa.eu/research/innovation-union/index\\_en.cfm?pg=intro](http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=intro)

<sup>2</sup> EU Framework, Horizon 2020; <http://ec.europa.eu/research/horizon2020/pdf/press/horizon2020-presentation.pdf>

<sup>3</sup> University Food Stanford as a Living Lab, <http://www.youtube.com/watch?v=iJ1ORCIjdY4>

<sup>4</sup> European subsidy for Living Lab The Hague, 22 August 2011, from <http://en.denhaag.nl/en/residents/to/European-subsidy-for-Living-Lab-The-Hague.htm>

that societal inclusions in the innovation process, sponsors this trend or that this is an effect of the ever increasing accessibility to infrastructures and tools that weren't available in previous decades.

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# Motivations and Risks Analysis of University-Industry-Research Collaboration in China

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**Abstract:** This paper finds the University-Industry Cooperation as a strategic significance in terms of the cultivation of engineers at different levels, scientific research, knowledge innovation and industrial requirements. Our recommendations focus on Chinese University skills development, on the mutuality in the collaboration and on the general factors of success. The findings will help both academies and industries to define their needs and further understand all the advantages offered by a U-I partnership.

**Key words:** University-Industry research collaboration; Innovation; Research & Development; Strategic Alliance

## 1 Introduction

Since China opened its doors to the World, Chinese Government tries to improve the global economy by using innovation ideas and new technologies. Chinese High Education researches pay more attention on knowledge creation and technology development. On the other hand, Chinese Industries manage their profitability, growth and sustainability by using innovation strategies to face International competitors<sup>[1]</sup>. This study defines the motivations and risks that push or inhibit these two entities to start collaborating together on Research and Development. We will first define the term of innovation and give a brief overview of the situation in China. Subsequently, we observe the advantages and risks of this alliance from each side opinion. Finally, we are going to propose some ideas to improve the University-Industry collaboration strategy methods in China.

## 2 Definition of University-Industry (U-I) partnership

### 2.1 Literature review of innovation

Rogers and Shoemaker (1971) defined innovation as any ideas, products or process perceived as new by the public. According to Classic, Neoclassic and Keynes's economy theories, technical progress is an external factor that disturbs equilibrium in the economy growth and which influence the market. Modern Economists like Favre-Bonte (2007), affirms that innovation depends on the organization competence and capacity to conduct Technological progress on the current economic growth. Favre-Bonte talks about Technical innovation, commercial innovation, organizational innovation, financial innovation and social innovation in the organization. New theories pay more attention to innovative ideas and activities that can influence the economy growth<sup>[2]</sup>.

### 2.2 Overview of Innovation in China

The Chinese Government developing strategy focuses on becoming an "innovation oriented country" by warning the public and promotes an internal independent innovation<sup>[1]</sup>. China already did great improvements on industry growth and amelioration of the engineering education quality. Chinese want to seek leapfrog development in key areas, make breakthroughs in key technologies and conduct basic research with the long-term perspective<sup>[3]</sup>. Chinese Government plays a leading role in this innovation development to help the Chinese Companies, Inventors, researchers, Research institutions and Universities to educate. Chinese Government allocated f20.6 billion USD for technology research which represents 1.4 percent of China's GDP. In addition, China has the world's largest technician workforce (35 million), 1.42 million R&D researchers, and over 25 million University students all supported by the Government for innovation research projects<sup>[4]</sup>.

## 3 Motivations and Risks to Collaborate

### 3.1 Motivations to collaborate

#### 3.1.1 Reasons for the firm

Strategic alliances help to improve competitive objectives as decreasing production costs, improving productivity, improving quality and reinforcing innovation (Garrette and Dussauge, 1995). Many reasons push firms to collaborate with Universities that works in the same field. First of all, U-I Alliance helps firms to fulfill the gap between their future needs and their current capacities in

innovation. Firms access to rich intellectual resources, new researches, new techniques, new technologies, innovative processes and potential products during this strategic association. Indeed, Universities bring new ideas, knowledge, strategies, concepts and an external point of view to the Company which can improve their competitive advantages and grow. It is a fact, this collaboration stimulate companies' internal Research and Development program for better productivity, quality products, standard living in the working environment and more efficient methods.

Then, firms can save some researches expenses through this collaboration because Universities experts and lab space are cheaper in the market. Agriculture, biotechnology, chemistry, computer science, engineering, biotechnology and medicine are most likely areas to benefit commercially from this collaboration. Indeed, Universities researches mainly focus on medical technologies (45%), products (75.6%) and chemical process (45.4%). These sectors financial investment on R&D are the most expensive ones, consequently a U-I collaboration bring an important advantage to them<sup>[5]</sup>.

Employees' skills increase during this co-creativity experience by sharing knowledge with the University and generating new sources of growth. Wuhan University of Technology received \$110 million of research funds and earned \$300 million revenue from Hi-Tech commercialization at their scientific Park in 2011.

In addition, firms can improve their innovation system in basic research, gain more industrial practice and reinforce their prestige by participating on journal articles production with the University. The public, industry and economy can access to the firm's Research and Development information through their fundamental researches which can result to patent. Finally, firms better maintain a close relationship with Universities that can provide competent graduated students for future recruitment.

### 3.1.2 Reasons for the University

Universities need large financial support to buy expensive equipment and material for their research, so they should to work with firms willing to sponsor them. University-Industry brings important advantages to the University which also benefit of cheaper research assistant from the firms. For example, Wuhan University of Technology in China has obtained nearly RMB 3 billion of funding from government and industrial sectors for high-tech research and development, and has made a lot of innovative and important technological achievements.

Additionally, University-Industry collaboration increases the reputation in the public's mind and attracts further students who desire learning in an esteemed School. For example University of Birmingham (United Kingdom) is a prestigious University that collaborates with worldwide famous Industry partners as Ernst & Young, Hermes, Deloitte, Worship Company of International Bankers. Likewise, the numbers of quality article journals are a reference for the University success and reputation. Universities can get patent and license from the commercialization of their academic researches.

U-I collaboration does only use the University's skills for commercial use but it is also an opportunity for the students to get practical experience. Indeed, students are rich of theoretical knowledge, but they need real experience to complete their competency. Indeed, Students have the opportunity to center their research topic on this precise case, they learn to set goals and gain experience along the R&D process. In stride, the research team composed by students and teachers become a reliable source of information and knowledge to discuss and confirm theories according to a concrete case study. And finally, Universities have the advantage to offer job opportunities for students in specific field and Companies<sup>[5]</sup>.

## 3.2 Risks and barriers

Nowadays organizations are not considered anymore as "machines with human elements" but as a "social systems where multiple groups with conflicting interest coexist" (Coombs; Saviotti, and Walsh 1987). This quote expresses that even inside an organization each unit has his own objectives and values<sup>[6]</sup>. Consequently, risks of conflicts between the organization and an external collaborator are even more probable.

### 3.2.1 Risks and barriers for the Universities

Universities face risks of their research teams' organization because of lack of experience and communication. Universities lack of marketing, technical and negotiation skills can be a liability for them to attract Industries. They also have to follow the firms' corporate and scientific norms all along their research which might limit their researches. Indeed, if the researches don't bring enough benefits Universities will lose time, money, their reputation and the Industry's trust. Universities

should pay attention of unrealistic expectation from the Industry regarding the technology and financial fund that they received. Poor rewards for University researchers might demotivate students to take part of future collaboration.

### 3.2.2 Risks and barriers for the Firms

The industries wish to maximize their benefit by developing their production to satisfy the society's needs and keep a private knowledge base to have a strong competitive advantage. On the other hand, Universities mission is to cultivate students' knowledge to share knowledge with the society through publication, notoriety of the researchers and critics of the other research centers. So there might be a moral risk for the firm if the University doesn't respect the Industry copyright by publishing private information in its articles.

Additionally, some firms are unfamiliar with the collaboration program and see some management risk due to the organization between the different teams and cooperation risk that will affect them. Firms are restrained to collaborate because of profit risks and time risks.

And finally, Industries think that Universities lack of experience and knowledge about the market cannot help them to solve their innovation problems. According to these firms, Universities have a lack of market knowledge and they don't share the same vision <sup>[6]</sup>.

## 4 High Performance Requirement

### 4.1 Development of skills

In order to convince more local and International Industries to invest in this collaboration, Chinese Universities should deliver more innovation-oriented students. Universities need to encourage the students to adopt a problem solving approach, organize more student group work, develop their statistical thinking, and implement systems for proper feedback. Academic courses should adopt a project-oriented teaching, experimental learning and curriculum development. Chinese Universities should ameliorate their training scheme offered to the students and improve learning requirements to develop their knowledge and creative abilities <sup>[6]</sup>. Universities should regularly update their knowledge thank to case studies, researches, theories, and training. In fact, Students should attend to Industry training every year with report production to improve their technical experience and research about the interested field. This kind of training can improve more students' skills and help all of them to increase their contacts in the field and improve their chance of employment after their graduation.

In addition, students have to be familiar with foreign firms by knowing how to communicate with them (methods and languages). Large knowledge of the innovation field with quality comprehension and practical abilities are important requirements that Industries want from the students. So in order to reach this goal, students have to develop their practical abilities through exchange with foreign Schools, by doing training in firms in local Companies and abroad which improve their understanding of the market's need <sup>[7]</sup>.

Universities should provide quality professional for China's industrial sectors. Teachers in Universities should have years of work experience in the field like retired engineers and industry expert as advisors. Universities can develop programs to send some teachers abroad during a specific time to gain international working experience. Domestic and foreign firms in the country or abroad should work with Universities as partners of research. Long-distance advisors that can communicate with Chinese students through video-chat and emails can help them to obtain international specifications to judge their research products.

Universities should encourage informal relationship, social networks and regular communication with the Industry through website to update the knowledge transfer. Academic program should help the students to develop their communication skills. Without a doubt, students have to know how to define each role and responsibility in the team.

### 4.2 Mutual transfer innovation knowledge

At the beginning of the collaboration, contract should stipulate data ownership, mutual agreed objectives and interest in any product developed. Copyright and privacy agreements are vital to avoid conflicts between the two parts and to keep an excellent University-Industry relationship. They should agree on which information should stay private in the firm, about the special access to critical department, and research on core technology should only being done by their own employees. Conduct systemic researches on system, mechanism, rules, regulations, modes, methods, operational approaches and procedure. Universities cannot have a fundamental role in developing new process and product;

only the marketing and production department should be responsible for this part. The Marketing Department can share some knowledge from experience about market and customer tastes to the students for their training and market analysis. So Innovation knowledge transferred for the students basic researches should focus in productivity, knowledge innovation and industrial upgrade with respect of property rights.

Industries can give a delay of 6 months to the University before publishing the articles that they previously checked. During this time the Industry can get a patent and protect their intellectual property and let the University to share the information with the public. Each part should recognize research contributions from the other part through gratification. To control the Universities information in each article, Industries should do a joint research and enjoying more prestige in the same time.

Industries have to provide high quality staff to join the research project in order to lead the team, share vision and reach the firm's aims. Industry should give equality of power to each member of the research team for an equal contribution.

### 4.3 Apply universal success methods

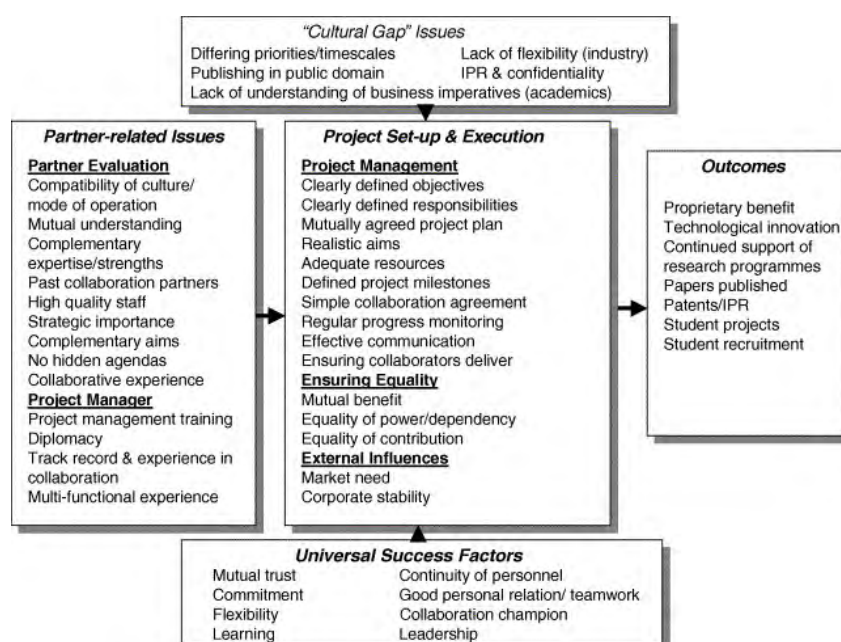


Figure 1 Management "Success" Factors Identified from the Literature

As shown in the previous scheme, all the requirements for a successful U-I collaboration are an efficient partner evaluation, the project manager skills, the project management quality, the sense of equality in the relationship and some external influences.

In addition, Government should support skill development, knowledge production and transfer between Universities and Industries. Indeed, the Chinese Government should reward Industry's financial investment to encourage them to collaborate together [8]. The Chinese Ministry of Education could arrange internship program to match Industries' needs with Universities' needs of research projects. Chinese Government better co-sponsoring a part of the research projects to support the Industries investment. In order to strengthen the University-Industry cooperation in China, both parts have to think about long-term and short-term win-win interests.

From this perspective, Universities better promote the importance and advantages to collaborate with them in order to attract them. Universities should send some convincing Representatives to travel abroad and promote the University's research faculty to potential industry sponsors R.

In the other hand, Industries should accept risks and try a University-Industry program during a short period by specifying terms of confidentiality. Build basic understanding and capabilities in teams.

Finally, Government should develop creative culture by offering a new lifestyle to the Chinese population who is becoming more and more intelligent about products and new technologies. Government, Universities and Industries should analyze future needs in employees from science and technology sector to promote education field.

## 5 Conclusion

University-Industry-Research collaboration is an efficient strategy to form talents training system and technological innovation. This collaboration attracts Universities for the financial support of Academic innovation research projects, and Industries the transfer technology to the commercial environment. Firms face the most risks but gain the most benefits from this less expensive R&D strategy. On the other hand, Universities have to match their skills with the Industries needs to attract more and more sponsors for their research project.

Managers know that today, the best strategy is not only based on the price, quality and delivery but the firm should be speed, flexible and innovative. In this new knowledge economy, link between public and private R&D could improve quality, quantity and speed of technology diffusion in economy.

The Chinese developing strategy focuses on becoming an “innovation oriented country” by warning the public and promotes an internal independent innovation. China already had great improvements on industry growth and amelioration of the engineering education quality. China will continue its reform and opening-up policy for a long-term to grow its economy, innovation independence. China is more and more open to International cooperation demonstrated by the application of International rules and practices. Indeed, Knowledge production is becoming a vital requirement for an innovative nation.

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## Industry-University-Research Institute Strategic Alliance Model: Classification Standard and Selection Strategy\*

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**Abstract:** The Industry-University-Research Institute Strategic Alliance (IUR) has played an important role during the construction of an innovation-oriented country. Because the IUR model directly affects IUR's organizational form, operating mechanism, structure stability and the mode of benefit distribution, it is a necessity to attach great importance to the selection of IUR models. Nevertheless, owing to a lack of unified classification standards and effective selection strategies, it is in the predicament to select an appropriate IUR model. To solve these problems, this paper firstly points out that the IUR model, from an economic perspective, is in nature a model of innovation resource allocation. And then, it analyzes the innovation resources of IUR and superior resources of each innovative partner. After that, as it puts forward, the principle of IUR's innovation resource allocation should realize the effective combination of innovative partners. Based on this principle, this paper presents the "innovation stage-cooperation level" classification standard and "monopoly degree-technology readiness level" selection strategy.

**Key words:** Industry-university-research institute strategic alliance; Industrial technological innovation; Model; Classification standard; Selection strategy

### 1 Introduction

With the acceleration of global economic integration, international competition is increasingly fierce, technological complexity is considerably rising, and the risk of innovation is dramatically increased. To gain a competitive edge, China is actively building an innovation-oriented country. China has laid down related industrial planning and made supporting policy to enhance the innovation capability of Chinese enterprises. At the same time, China's scientific and technological resources have been gathered for a long time in universities and research institutes. Therefore, the government, the business circle, the academia and research community attach importance to the great resource potential to promote the development of Chinese enterprises<sup>[1]</sup>. As an organizational model of collaborative innovation, IUR becomes the focus of attention<sup>[2]</sup>. IUR refers to a long-term maintaining, stable, mutually beneficial, symbiotic collaborative relationship between academia and industry, and it is a cooperation model to achieve a all-win interaction among enterprises, universities and research institutes. It is a system with enterprises as the main body, guided by market and featured by combination of all the superior resources of innovative partners to create the innovation chain. With explicit purpose and strong organizational support, IUR can enhance the capability of independent innovation and improve core competitiveness. In many research fields of IUR, the model of IUR has impact on the organizational form, operating mechanism, organizational stability and the mode of benefit distribution, which directly affects the success of the collaborative innovation. Therefore, it has always been the focus of all IUR's collaboration partners. Many institutions and scholars have researched on the classification, comparison and selection of IUR models.

OECD gives seven models of university-industry collaboration: general research support, informal research collaboration, contractual research, knowledge transfer and training schemes, collaborative research with government support, research consortia and cooperative research centre. Atlan (1987) divides the ways of university-industry interaction into: general R&D funding, collaborative R&D, R&D center, university- industry R&D alliance, industrial co-ordination unit in the university, business incubator and science park<sup>[3]</sup>. Bollon & Robert (1994) lists several ways of university-industry cooperation: scientists introduce new ideas and technologies to students, college students work in laboratory of enterprises, enterprises use the experimental facilities that university temporarily not using, scholars go to industry and make the report; enterprises provide university with a variety of devices and equipment<sup>[4]</sup>. Morasch (1995), from the economic perspective of transaction cost, analyze the selection

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problem of the collaborative innovation model<sup>[5]</sup>. From the perspective of knowledge management and strategic management, Carayannis (2000) analyzes the collaborative innovation model between government, industry and university<sup>[6]</sup>. Chinese scholars such as Wang Xue-yuan (2005), in accordance with the organizational forms, divide IUR model into co-building research institution, project-based alliances and co-building business entity<sup>[7]</sup>. According to the role of the partners play, Li Yan-yan and Ye Bing (2004) divide IUR models into four categories: government-oriented type, business-oriented type, universities-oriented type, and all-partners-oriented type<sup>[8]</sup>.

Through the analysis above, it is obvious that these researches simply conclude the model of IUR according to various classification standards. Their differences lie only in appellation, but they are essentially repetitive, telling the same or similar thing. Due to lack of unified classification standards and the effective selection strategy, there are many difficulties in selecting the appropriate IUR model. This paper attempts to put forward unified classification standards and come up with effective selection strategies of IUR models.

## 2 Economic Perspectives on IUR

The scarcity of resources is the foundation and precondition of all economic analysis<sup>[9]</sup>. Economic efficiency requires efficient resource allocation and greater output with the limited resources<sup>[10]</sup>. As a form of collaborative innovation, IUR aims at a reasonable configuration of knowledge, technology, funding, manpower, information and other resources and obtaining maximum output. Its operation process can be regarded as a special kind of production activities. From this point, the selection of IUR model, in essence, is the choice of the resource allocation model. In order to allocate resources efficiently, we need to analyze innovation resources of IUR and make clear the superior resources endowed by each innovative partner.

### 2.1 Innovation resources of IUR

Innovation resources are the production factors inputting throughout the collaborative innovation process. To accurately define the main innovative resource of IUR and analyze its role in collaborative innovation is the premise of efficiently allocate innovative resources. After in-depth analysis, this paper puts forward nine categories of innovative resources input by IUR.

**Table 1 Main Innovation Resources of IUR**

Resources	Description
Knowledge	The starting point of innovation, such as explicit knowledge, implicit knowledge.
Technology	Operation methods and skills, such as technical patents, engineering technology
Funding	Mainly comes from enterprises, venture funds, universities, government etc.
Policy resources	Mainly refers to the policy support, financial support, the tax rate relief etc.
Material resources	R&D facilities, equipment and instruments, production base, and ancillary facilities.
Market resources	Insight of the market capacity, market development, sales channels.
Information	The ability to discover, store, identified information of other innovation resources.
Manpower	The staff engaged in knowledge creation, R&D, industrialization, and management.
Contract	Formal and informal contracts signed by innovative partners.

### 2.2 Innovative partners of IUR

The innovative partners of IUR refer to enterprises, universities, research institutes, governments and intermediaries who input innovative resources for profit. These partners are directly or indirectly involved in collaborative innovation activities. Analysis of the superior resources of each partner has great significance in choosing cooperative partners of complementary resources.

Industry, primary, secondary and tertiary industries included, refers to the competitive enterprises whose goal is to gain profits. Enterprises generally have a lot of money. With keen insight and quick response to market needs, enterprises can improve the relevance of research and development of the alliance and help to realize the economic value of the result as soon as possible.

Universities and research institutes are the output of scientific knowledge, personnel training, with some research capacity, such as colleges, universities, public or private research institutes. It masters the latest technology and research frontier. With libraries, research centers, advanced laboratory equipments

and highly qualified researchers, universities have great R&D potential.

Governments, through industrial plans and technology development strategy, makes supportive policies to actively guide the direction of the IUR and enhance the independent innovation capability and technological level of domestic enterprises.

The five different types of partners above, with their respective strategies and respective superior resources (table 2), ally with some complementary partners forming the IUR.

**Table 2 Main Superior Resources of Innovative Partners**

Partners	Main Superior Resources
Industry	Funding, market, material, manpower, technology
University	Knowledge, technology, manpower, material, funding
Research institute	Technology, Knowledge, material, manpower, funding
Government	Policy, funding, information, contract
Intermediary	Information, funding, contract

**2.3 Principles of IUR’s innovation resource allocation**

The innovation resource allocation of IUR is a process where within the context of collaborative innovation. A innovative partner, with some superior resources, cooperates with others possessing with complementary resources to form a collaborative innovation system. This reallocation of resources for the whole innovation system is a pareto improvement. The motivation to involve in the collaborative innovation is that partners attempt to gain more benefits by inputting their limited innovative resources. Its overall purpose of IUR is to rationalize innovative resources to maximize the output with limited innovative resources. Therefore, resource allocation principle of IUR is the effective combination of innovative partners. We believes that the IUR model reflects the combination of innovative partners. So this paper studies deeply the classification standard and selection strategy of IUR models.

**3 “Innovation Stage-Cooperation Level” Classification Standard**

The value orientation, superior resources, and the purpose of joining alliance are various according to different types of partners from enterprises, universities, research institutes, governments to intermediaries. Therefore, the IUR models are various. To choose an all-win model is the key to the success of IUR. This paper presents “innovation stage-cooperation level” classification standard, which classifies the models of IUR from two dimensions: innovation stage and cooperation level. The innovation stage refers to the process that knowledge and technology are gradually transformed into product prototype. From the upstream to the downstream of the innovation chain, it can be divided into three stages: fundamental research, application research and technical development. The cooperation level refers to the degree of close collaboration, which is divided into “primary”, “intermediate” and “advanced”. By referring to other scholars’ research on the model of collaborative innovation, the classification of IUR models was shown in Figure 1.

Cooperation Level	Advanced	Joint Research Institute	Business Incubator Joint Business Entity	Joint Business Entity Business Incubator
	Intermediate	Joint Key Laboratory	Joint Engineering Research Centre	Joint Technology Development Centre
	Primary	Entrusted Research Entrusted Training Cooperative Education	Entrusted Research Patent Licensing Cooperative Education	Patent Licensing Entrusted Training Cooperative Education
		Fundamental Research	Application Research	Technical Development

**Figure 1 The Classification of IUR Models**



The “innovation stage-cooperation level” classification standard can apply to all kinds of IUR models. Using this classification standard, characteristics of each model will be visually shown, which greatly facilitates the comparison and selection of IUR models. As for models which are not included in Figure 1, after analyzing their innovation stage and cooperation level, this classification standard will still work.

#### 4 “Monopoly Degree-Technology Readiness Level” Selection Strategy

The IUR models, which reflect the cooperative model of innovative partners, are the result of multiple factors. Innovative partners, with different resource endowments, different negotiating capital and different interest demands, require different models. The main aim of the each partner is all to maximize the benefits of its innovation resources. Therefore, the higher a partner presents its monopoly degree in innovation resource, the more advantages it will gain in negotiations. In a word, high-level alliance obtains more benefits. At the same time, the more mature the technology is, the more importance the alliance should be given to the development and application of technology, and the downstream model of the innovation phase is adopted.

Referring to Figure 1, the “monopoly degree-technology readiness level” selection strategy of alliance models can be summarized as follows.

Strategy A: The higher degree of monopoly the innovative partners possess, the more advanced forms of cooperation should be adopted. Only by so doing can the partners maximize the benefits of the innovation inputs. On the contrary, the more primary model should be adopted. (See Figure 2)

Strategy B: Less proficient collaborative innovation should adopt the upstream of cooperation in the innovation phase. In so doing, the partners could share the cost and risk of R&D and promote the exchange of knowledge and technology. On the contrary, the downstream of cooperation in the innovation phase should be adopted. (See Figure 3)

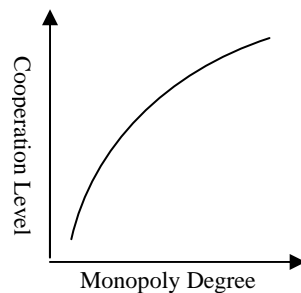


Figure 2 Strategy A

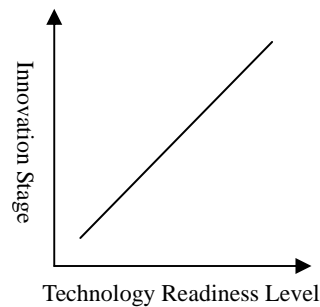


Figure 3 Strategy B

#### 5 Conclusion

The IUR model is essentially a model of innovation resource allocation. By analyzing the nine innovation resources of IUR, and exploring respective superior resources of five innovative partners, a theoretical basis will be founded to effectively allocate innovation resources of IUR and select appropriate IUR models for innovative partners.

The innovation stage-cooperation level classification standard provides a unified classification standard. It combines the characteristics of existing standards and overcomes the limitation caused by simple classification rules, such as limited models, generalized or ambiguous definitions etc. It is a flexible classification standard according to which it classifies IUR models by two dimensions: innovation stage and cooperation level. In general, the innovation stage-cooperation level classification standard could apply to most IUR models when their innovation stage and cooperation level are analyzed. Therefore, this classification standard can cover most IUR models and visually display each model’s features, which makes it convenient to make a comparison of IUR models.

The monopoly degree-technology readiness level selection strategy is effective. Innovative partners could evaluate relative monopoly degrees of their innovation resources through investigation, and then select the corresponding cooperation level by using Strategy A. Generally speaking, the higher the cooperation level is, the more values of scarce innovation resources could be realized. In doing this, it is beneficial to maximize the innovation resource’s benefits of each partner. After that, innovative partners could collectively evaluate the technology readiness level and decide the reasonable innovation stage of their cooperation by using Strategy B. Taking into account both Strategy A and Strategy B, innovative

partners are able to select IUR models accurately.

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# Creating Shared Value Through Strategic Corporate Social Responsibility

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**Abstract:** The Literature review about corporate social responsibility (CSR) suggests that there are organizational benefits to be gained from unintentional discretionary expenditure in laudable behavior. With this in mind, the methodology integrates insights from the stakeholder's theory and the resource-based views to sharpen the strategic base for CSR investment. Quantitative research techniques have been used to discover how the hospitality business organizations are creating shared value for themselves and for society. Correlation and Regression analysis tested the relationship between Strategic CSR (in terms of the organizational benefits) against the firms' commitment, behavior and resources devoted to CSR. From the findings a research a model is derived to determine the synergistic value creation for businesses and society.

**Key words:** Corporate social responsibility; Shared value; Strategic CSR

## 1 Introduction

Businesses' way of thinking has changed dramatically since Levitt, (1958) and Friedman (1962, 1970) held that the companies' only responsibility is to maximize their owners' and shareholders' wealth. Corporate social responsibility (CSR) has developed during the latter part of 20th Century as the recognition of all stakeholders, rather than just shareholders being the legitimate concern for the business, see Freeman (1984). CSR has been described as a rather vague concept of moral good or normative behavior; see Frederick (1986), Carroll (1979, 1991, 2004). An all embracing definition was given by Moon et al. (2009), 'CSR is about beyond-compliance contributions of companies to social, environmental and ethical concerns'. Whilst retaining the comprehensive aspects, Carroll (1979) suggested a relativistic measure of 'the economic, legal, ethical and discretionary expectations that society has of organizations, at a given point of time'. With an entrepreneurial stance, Drucker (1984) characterized it as a way of tackling 'social problem(s)' to engender positive 'economic benefit(s)' to ensure 'well paid jobs, and ... wealth'. Porter and Kramer (2006) recognized that 'CSR can be much more than a cost, a constraint, or a charitable deed'. Apparently they perceived CSR, 'as a source of opportunity, innovation, and competitive advantage'. There have been diverse theoretical perspectives surrounding the notion of CSR. McWilliams et al. (2006) emphasized that CSR research requires a multi-disciplinary approach. They describe it as a '...fertile ground for theory development and empirical analysis'.

This paper maintains that laudable CSR initiatives can be re-conceived strategically to confer competitive advantage. The business case for CSR focuses on building adaptive approaches and directing resources towards the perceived demands of stakeholders. Stakeholder demands are viewed less as constraints on the organization, but more as challenging opportunities which can be leveraged for the benefit of the firm. This paper looks at different aspects of strategic CSR, as it makes specific reference to responsible human resources management, sustainable environmental practices, marketplace and community policies which can create shared value for the business and the society. This paper addresses a knowledge gap in literature as it reports the effects of strategic CSR engagement among the Maltese hospitality enterprises.

## 2 Aims and Objectives

Although there is an extensive list of publications surrounding tourism enterprises and sustainability (e.g. Graci, 2009; Dodds and Kuehnel, 2010; Graci and Dodds, 2009; Merwe and Wöcke, 2007; Ayuso, 2006, 2007 and Kasim, 2006) this area of study may seem relatively under-researched particularly when considering relevant research which links hospitality enterprises and responsible entrepreneurship practices. It is the intention of this study to show that the hospitality businesses may stand to gain from their social and environmentally-responsible behavior. This research project was built on the foundation of the following research questions:

- What are the current insights and perceptions of responsible entrepreneurship among the owner-managers of the hospitality enterprises?

- Are the hospitality enterprises actively engaging in CSR (social and environmental) practices?
- What is their business case for CSR (in terms of CSR's costs and benefits)?

### 3 Literature Review

#### Conceptual Framework

Several enterprises are putting their values into a written code of conduct, a statement of good business practice or even a set of simple rules which articulate the company's vision, values, responsibilities and ambitions (Ingenhoff and Fuhrer, 2010). Defining and communicating the company values will help businesses and their employees to remain true to what they believe in and will help to build their reputation. The mission statement and vision of the company ought to be communicated to the stakeholders and the community at large. Employees like to work for and with others who share their values, so organizational commitment for CSR may help to attract quality employees, customers, suppliers and investors who approve of the business' principles (Davies and Crane, 2010). It is imperative that the company values will in effect mirror the enterprises' business ethos, and its context. This leads to the first hypothesis:

**Hypothesis 1: There is a positive correlation between strategic CSR benefits and organizational commitment.**

Generally, some of the socially and environmentally responsible initiatives most commonly recognized among businesses are: skill development and training activities for employees (Bohdanowicz and Zientara, 2009), safeguarding the employees' health and safety (Maignan and Ralston, 2002 and Fombrun, 2005), positive involvement within the local community, support of cultural activities, the environmental protection (Ayuso, 2006) as well as sponsorships and donations to charitable institutions (Carroll, 1979; Mohr et al., 2001) among others. The long-term success of any business and its ability as an effective entrepreneur often relies on the competencies and motivation of employees (see Zeitz et al., 2009). Employees represent one out of many other stakeholders addressing the company with demand (Turker, 2009). Arguably, businesses present social security by offering safe employment positions and good innovative working practices, as evidenced by Ozcelik et al. (2008). Seitanidi (2009) demonstrated that employers need to build good internal partnerships with their employees. The businesses themselves will benefit from employee involvement, in terms of generation of ideas, commitment and loyalty. This was shown by Mc Shane and Cunningham (2011); Kim et al. (2010) and Turker (2009). Environmental performance often makes financial sense for the organization itself (Gjolberg, 2009 and Muller and Kolk, 2009). Energy efficiency, waste minimization, pollution prevention and recycling can potentially result in significant cost-savings for any firm (Tudor et al., 2008; Williamson et al., 2006) as well as enhancing the firm's reputation and standing (Fombrun, 1996; Lewis, 2001). The organizational behavior to green policies translates to added value and mutual benefits for the business and the environment (see Holcomb et al., 2007; Lee and Park, 2009; Chiang and Hung, 2010).

The way enterprises operate within the market is a vital indicator of how they have integrated social and environmental concerns into their mainstream organizational structure and decision making processes. Good positive relations with stakeholders will leverage the value chain of any organization, (Jones et al., 2006; Bhattacharya et al., 2009). Social networking is always a very basic requirement in business. A firm's business policies are continuously evaluated by suppliers, customers, competitors and the local community. Marketplace policies are devised to trigger customer satisfaction and enhance the quality of the service (Walsh and Mitchell, 2010). Marketplace policies can often lay down the essential criteria of how to select prospective business partners. They can possibly favor and support local suppliers (Porter and Kramer, 2006; Jenkins, 2006). In order to maintain good business relations, there should be some procedures laid down (e.g. the paying the bills on time). Appropriate marketplace behavior increases the reputation of the firm, resulting in stronger partnerships with suppliers (Spence and Bourlakis, 2009), more efficiency and better mutual understanding (Carroll, 1991, 1999; Porter and Kramer, 2006, 2011; Young and Tilley, 2006). Several managers have realized that there is further potential for more firms to get involved in societal and community activities (Scholtens, 2009; Rettab and Ben Brik, 2008). For instance, there is scope in supporting social cases, environmental causes, heritage protection, philanthropic activities as well as cultural and sport related initiatives (Carroll and Shabana, 2010 and Du et al., 2010). It is in the businesses' interest to keep an open dialogue with the community on adverse, controversial or sensitive issues (Merwe and Wöcke, 2007; Ayuso, 2006). The community policies are considered essential and an integral part for responsible entrepreneurship (Fuller and Tian, 2006; and Nelson, 2006). The enterprises' community engagement may possibly add value to

the enterprise itself. This leads to next hypothesis:

**Hypothesis 2: There is a positive correlation between organizational behavior and strategic CSR benefits.**

The Resource Based View (RBV) theory suggests that resources of the firm affects its activities and growth (Penrose 1959), profits (Wernerfelt 1984) and the level of sustained competitive advantage (Barney 1991). Firms may be potentially constrained by a lack of resources. Younger firms may often lack experience and therefore tend to rely on informal management systems and training practices (Cardon and Stevens 2004). Liability of smallness implies problems in competing for labor with larger organizations and recruiting and training employees (Aldrich and Auster 1986). This condition distinguishes them from their larger counterparts and requires some very different management approaches. O'Cass and Weerawardena (2009) held that resource poverty hinders the adequate performance of certain activities such as appropriate training of new employees. In addition, the small firms may also have difficulties in pursuing new approaches to successful personnel management, due to their lack of information about the recent HRM developments in other companies (Bacon et al. 1996). Bird et al. (2006) found that the availability of discretionary resources drives management's interest to finance CSR activities. Perhaps, that's why large firms show greater corporate financial performance and corporate social performance (CSR engagement). Macher and Richman (2008) argued that the transaction cost economics show that CSR is not cost-free. CSR often requires substantial resources, including time. Financial and human resources are required to identify the relevant stakeholder groups; negotiating with representatives of such groups, and monitoring their satisfaction (Orlitzky and Swanson, 2008; King, 2007). This leads to the next two hypotheses:

**Hypothesis 3: There is a positive correlation between organizational resources and Strategic CSR benefits.**

**Hypothesis 4: The organizations' commitment, behavior, its available resources, as well as its societal relationships will lead to strategic CSR benefits.**

The literature review suggests that the most strategic CSR occurs when a company adds a social dimension to its value proposition (Porter and Kramer, 2011). The authors held that the solution for strategic CSR lies in the principle of 'shared value'. Other recent value creation propositions include; 'value in business' (Lindgreen et al. 2012); 'value creation through social strategy' (Husted et al. 2012) and 'The Stakeholder Approach to Maximizing Business and Social Value' (Bhattacharya et al., 2012).

**Hypothesis 5: The organizational behavior and commitment, its slack resources and its optimal organizational performance will lead towards creating shared value in business and society; leading to stronger societal and regulatory relationships.**

Arguably, the rationale for doing good by doing well may be triggered from the firms' availability of slack resources. Orlitzky et al. (2003) have supported the view of reverse causality from financial performance to organizational behavior for CSR. In good economic times, the high levels of financial performance may provide the slack resources which are duly required to successfully engage in CSR (Ullmann, 1985). Carroll (1979) held that CSR often represents an area of relatively high managerial discretion. The availability of excess funds will determine whether there is the 'initiation and maintenance of voluntary social and environmental policies' (McGuire et al 1988). For instance, if the organization has gone through a period of consistent satisfying results, with good corporate financial performance, the executives may exhibit a sense of obligation to give something back to the community (Economist, 2006). On the other hand, if the firm has recently experienced low profits and has scarcer resources at its disposal, then the firm may not engage itself in CSR activities and investments. This leads to the last hypothesis.

**Hypothesis 6: Strategic CSR's financial performance outcome is a precursor of organizational behavior (for CSR).**

## 4 The Method

The research fieldwork was carried out in Malta, the smallest country of the European Union. The main reason for choosing this country for the data collection purposes was that the quantitative study had targeted all the hotel owner-managers of the licensed accommodation establishments across the Maltese islands. A web-survey questionnaire has been administered between October, 2010 and January, 2011. The hospitality enterprises which were chosen to take part in this research project included hotels ranging from 1 star to the 5 star categories (comprising guest houses and hostels). The survey questionnaires were distributed by email to all the ninety two licensed hotels. Subsequently, the completed surveys were personally collected. There was a total seventy-two (72) out of ninety two (92)

valid responses (which represented 78% of the total population) from all the accommodation establishments in Malta, as featured in Table 1. Evidently, there was insufficient response among the lower rated/classified hotels, possibly indicating that they were not seeing the business case in CSR engagement, or they had lower CSR credentials and / or awareness.

**Table 1 Online Survey Response Rate**

Hotel Category	N	Population	Total %
5 Star Hotels	13	14	92.86
1-4 Star Hotels	59	78	75.64
<b>Overall Total Response</b>	<b>72</b>	<b>92</b>	<b>78.26</b>

The objective of targeting the designated profile of owner-managers was to gain an insight into their ability to make evaluative judgments in taking strategic decisions in their enterprise. The owner-managers were required to indicate their level of agreement with the survey questionnaires' statements. In the main, the responses were coded using the Likert Scaling mechanism (except for the variables, 'HR department' and 'Stakeholders requesting data about CSR' - which were measured by dummies). There were different scales for the variables; 'CSR expenditure', 'period of CSR engagement' and 'enterprise future intentions', as reported in Appendix 1. For all the other variables, the values ranged from 1 (strongly disagree) to 5 (strongly agree) with 3 signaling indecision. A list of all the variables which were used in the survey instrument is illustrated in Table 2.

**Table 2 The Variables Used in The Survey Instrument**

<b>Socio-demographic Variables</b> 'Gender', 'Age', 'Role', 'Level of Education', 'Industry Experience', 'Organization Size', 'HR Department'.
<b>Organizational Commitment</b> 'Mission Statement', 'CSR Ethos', 'Period of CSR Engagement', 'CSR Future Intentions', 'Staff dedicated to CSR', 'Money devoted to CSR', 'CSR Expenditure Scale'
<b>Organizational Behavior</b> 'Training Employees', 'Consulting Employees', 'Health and Safety', 'Work-life balance for Employees' 'Environment Conservation', 'Waste Minimization', 'Pollution Prevention', 'Environmental Protection', 'Sustainable Transport', 'Procurement Policy', 'Supplier Relations', 'Customer Relations', 'Community Dialogue', 'Community Support'.
<b>Strategic CSR (benefits)</b> 'Employee Loyalty', 'Employee Morale', 'Job Satisfaction', 'Less Staff Turnover', 'Attracting Quality Employees'. 'Maximize Efficiency', 'Investor confidence', 'Brand Image', 'Customer Loyalty', 'Reputation', 'Competitive Advantage', 'Increase Sales', 'Increase Market Share', 'Enhance Marketplace Relations'.
<b>Creating Shared Value (benefits)</b> 'Legal Compliance', 'Third Party Pressure', 'Ethical and Philanthropic Reasons', 'Community Relations', 'Lower Criticism from the Public', 'Minimize Regulatory Relations'
<b>Organizational Resources (costs)</b> 'Financial Resources', 'Human Resources', 'Time', 'Training and Awareness', 'Economic Short-terms'.

The gathered data was subsequently transformed into a suitable form for analysis, using what is commonly referred to as data reduction techniques (Blaikie, 2010). Data reduction aimed to achieve the desired reliability, timely and accurate assessment of the findings, in an inductive perspective. The dataset was in Excel format and imported into SPSS. Initially, exploratory data analysis (EDA) and descriptive statistics were carried out to examine categorical data. Subsequently, there was correlation analysis of the main variables by using Spearman's rank correlation coefficient ( $\rho$ ). Principal component analysis and regression analysis were carried out in accordance with the previously set hypotheses. An effort was made to ensure that the data met the statistical significance requirements.

## 5 Analysis and Results

Descriptive statistics are presented for each and every variable in Appendix 1. Reliability and appropriate validity tests have been carried out in the analytical process. Cronbach's alpha was 0.85, indicating an acceptable level of reliability across all variables. The hotel owner-managers were requested to indicate their level of agreement with the given statements which reflected their attitudes and perceptions about responsible behavioral practices. In the process, they also clarified the benefits and costs of strategic CSR.

### Correlations

Spearman's rank correlation coefficient indicated that there were some interesting positive and significant relationships between the constructed variables. The correlations matrices are featured in appendix 2. In general, the hypothesized correlations were significant as they were close to zero, and predominantly they did not exceed 0.05. The significance levels were not surprising, given the sample size. The results from the first hypothesis regarding a positive relationship between organizational commitment and strategic CSR has revealed positive correlation coefficients, particularly between 'financial resources devoted to CSR' and 'attracting quality employees' ( $\rho=0.708$ ). Another substantial correlation has been registered between 'period of CSR engagement' and 'attracting quality employees' ( $\rho=0.700$ ); 'increasing sales' ( $\rho=0.635$ ). There was a moderate relationship between 'period of CSR engagement' and 'improving market share' ( $\rho=0.488$ ). Similarly, there was covariance between 'CSR expenditure' and an 'increase in sales' ( $\rho=0.505$ ) and market share improvement ( $\rho=0.572$ ). A moderate relationship has been found between 'staff dedicated to CSR' and 'increasing sales' ( $\rho=0.434$ ) and 'improvement in market share' ( $\rho=0.459$ ). The covariance in the second hypothesis has reached the highest levels between organizational behavior and strategic CSR where it has already been stated that the highest correlation coefficient of ( $\rho=0.948$ ) indicated a substantial relationship between 'competitive advantage' and 'procurement policies'. Additionally, very high correlation coefficients were registered between 'competitive advantage' and the organizational behavior's variables entitled, 'sustainable transportation option' ( $\rho=0.908$ ), 'energy and water conservation' ( $\rho=0.861$ ) and 'community support' ( $\rho=0.844$ ). As anticipated, there were strong relationships between 'attracting quality employees' (Strategic CSR variable) with 'community support' ( $\rho=0.799$ ) and 'environmental protection' ( $\rho=0.747$ ).

It was anticipated that the third hypothetical relationship between the firm's organizational resources (costs) and strategic CSR would be characterized by negative relationships. For instance, the relationship between the constraint variable entitled, 'lack of money' was inversely related to 'attracting quality employees' ( $\rho=-0.871$ ), 'competitive advantage' ( $\rho=-0.705$ ), 'increasing sales' ( $\rho=-0.629$ ), 'discretionary spending in ethical and philanthropic causes' ( $\rho=-0.611$ ) and 'market share' ( $\rho=-0.547$ ). Similarly, there were negative correlation coefficients between 'lack of staff' and 'attracting quality employees' ( $\rho=-0.462$ ) and also in 'discretionary spending in ethical and philanthropic causes', ( $\rho=-0.425$ ). Nonetheless there were some substantial to moderate positive relationships, particularly between 'economic short-terms' and 'increasing market share' ( $\rho=0.435$ ), 'competitive advantage' ( $\rho=0.435$ ) and 'minimize regulatory problems' ( $\rho=0.421$ ) and 'discretionary spending in ethical and philanthropic causes' ( $\rho=0.380$ ).

### Data reduction

The Principal Component Analysis (PCA) has been purposely chosen to obtain a factor solution of a smaller set of salient variables, from a much larger dataset (Hair et al., 1998). Moreover, this

approach was considered appropriate as there were variables exhibiting an underlying structure as they seemed to share close similarities. Therefore, PCA had identified the patterns within the dataset. Evidently, the underlying similarities (and differences) were highlighted in each and every component. In the process, the data has been compressed, as it was reduced in a number of dimensions without much loss of information. The rationale for the data reduction was to have in place the factor components for the subsequent multivariate regression analysis. From SPSS; the principal component analysis has produced a table which illustrates the amount of variance in the original variables (with their respective initial eigenvalues) which were accounted for by each component. There was also a percentage of variance column which indicated the ratio expressed as a percentage of the variance (accounted for by each component to the total variance in all of the variables). The sum of the eigenvalues equaled the number of components. Only principal components with eigenvalues greater than 1 were extracted. The factors accounted ranged between 64–85% of the variance before rotation. A summary of the results is given here, but the complete results from the factor analysis are reported in full in Appendix 3. Table 3 illustrates the number of extracted components from the original number of variables and presents the resulting cumulative percentage of variance for the group of variables (and also reports the related ‘loss of information’).

**Table 3 Data Reduction Through Principal Component Analysis**

Original Number of Variables		Cumulative Percentage of Variance %	Loss of Information %	Components Extracted
Org. Commitment	7	76	24	3
Org. Behavior	14	76	24	4
Org. Resources	5	85	15	3
Strategic CSR1	8	72	28	3
Strategic CSR2	6	75	25	3
CSV	6	64	36	2

Table 3 features the number of extracted components. The rotated component matrix was easier to interpret than the unrotated matrix, as the rotation maintained the cumulative percentage of variation explained by the extracted components. This variation is more evenly spread over the components. A brief description of the extracted factor component, together with their eigenvalue and their respective percentage of variance is provided hereunder in Table 4

**Table 4 The Extracted Factor Components**

Org. Behavior	Eigenvalue	Var.	Alpha
		Explained %	0.831
Innovative Environmental Practices	6.747	48.193	
Human Resources Policies	1.545	11.039	
Training and Development	1.247	8.909	
Marketplace Policies	1.055	7.534	(KMO 0.854)
Org. Resources	Eigenvalue	Var.	Alpha
		Explained %	0.823
Money	2.001	40.014	
Time	1.204	24.076	
Economic Short-terms	1.026	20.512	(KMO 0.510)
SCSR1: Firm's Performance	Eigenvalue	Var.	Alpha
		Explained %	0.901
Financial Performance	3.306	41.319	
Market Standing	1.879	16.631	
Reputation	1.114	13.928	(KMO 0.688)
SCSR2: HR & Operations MGT	Eigenvalue	Var.	Alpha
		Explained %	0.891
Employee Motivation	1.879	31.31	
Effective HRM	1.463	24.389	



Operational Efficiency and Cost Saving	1.162	19.365	(KMO 0.535)
<b>CSV: Societal Relations</b>	<b>Eigenvalue</b>	<b>Var.</b>	<b>Alpha</b>
		<b>Explained %</b>	<b>0.765</b>
Community Relations	2.651	44.191	
Regulatory Relations	1.173	19.553	(KMO 0.628)

The reliability measure was computed using Cronbach's Alpha. The Kaiser Meyer Olkin which measures the sampling adequacy was acceptable, in some cases it was well above the 0.5 benchmark (Field, 2005). The components were labeled following a cross-examination of the variables, which reflected the properties of the data contained within each and every component, particularly those variables with the higher loadings. Typically, the variables with the highest correlation scores had mostly contributed towards the make up of the respective factor component. The underlying scope of clustering the variables by using component analysis was to reduce the data and make it more adaptable for regression analysis.

#### **Multivariate regression analysis**

This section explains some of the relationships between the key variables by using the regression analysis. A stepwise procedure was purposely carried out to select the relevant predictive variables in the regression models. The number of potential explanatory variables was reduced and the regression model resulted in significant values. The *p*-value was less than the 0.05 benchmark and there were adequate F-ratios and adjusted Spearman's rho; which meant that the reported models were explained by variance. More importantly, the insignificant variables were excluded without appreciably increasing the residual sum of squares. The regression models produced the regression coefficients which represented the strength and significance of the relationships, as shown in Appendix 4. Moreover, the control variables, namely 'organization size' and 'HR department' were also entered into the equations.

#### **Strategic CSR benefits and organizational commitment**

One of the outcomes of the first hypothesis (H1) indicated that there was a positive and significant relationship between the firm's organizational commitment and financial performance (adj  $r^2=0.680$ ). This relationship was highly significant at ( $p < 0.01$ ). It transpired that the 'financial performance' is dependent on the firm's 'Size' (t-value = 4.626), 'CSR intentions' (t-value = 3.627), and 'staff dedicated to CSR' (t-value = 3.007). The following equation describes the relationship between financial performance and organizational commitment.

#### **Regression equation 1.**

H1: 'Financial Performance' =  $\beta_0 + \beta_1$  'Size' +  $\beta_2$  'CSR Intentions' +  $\beta_3$  'Staff devoted to CSR' +  $\epsilon$ .

There was a positive and significant relationship between effective HRM and the firm's organizational commitment (adj  $r^2=0.481$ ) at a 99% confidence level. Again, the stepwise procedure has excluded the insignificant variables from the model. When testing for this hypothetical relationship, it transpired that the firms' human resources management is dependent on the 'HR Department' (t-value = 5.174) and with 'staff devoted to CSR' (t-value = 2.841). This result indicated that the presence of an 'HR department' has positive effects on 'human resources management'. Interestingly, it also emerged that there are HRM benefits if there are staff within the firm who are specifically dedicated on CSR duties and responsibilities. The following equation describes the relationship between effective human resource management and organizational commitment.

#### **Regression equation 2.**

H1: 'Effective Human Resource Management' =  $\beta_0 + \beta_1$  'HR Dept' +  $\beta_2$  'Staff devoted to CSR' +  $\epsilon$ .

The results suggest that there is scope for organizational commitment in CSR strategy. The findings indicate that the firms (particularly the larger ones), should encourage their staff to involve themselves in CSR practices. This is consonant with the literature review. Jenkins (2009:31) proposed that the operationalisation (for CSR) may be performed from a change agent, i.e. a business champion. Alternatively the coordination of CSR activities may be delegated to a team of employees with the support of their senior managers. Grey and Smeltzer (1989) have referred to champions as individuals within the organization who pioneer new products or concepts, who are given the freedom to try out these ideas. Moreover, the empirical results which emerged from this study suggest that there were positive and significant relationships between operational efficiency and cost savings and the firm's organizational commitment (adj  $r^2=0.259$ ). The findings indicate highly significant relationships (where  $p < 0.001$ ). It emerged that the firms' 'operational efficiency' is dependent on 'CSR intentions' (t-value

= 5.043). The following equation describes the relationship between effective operational efficiency and organizational commitment.

**Regression equation 3.**

$$H1: \text{'Operational Efficiency'} = \beta_0 + \beta_1 \text{'CSR intentions'} + \varepsilon.$$

As management becomes more efficient in using and allocating resources within the organization, the firm enhances its internal operational efficiencies. Efficiencies often translate into savings (Holliday et al., 2002). Cost and risk reduction may be considered as a form of balancing interests among the social, environmental and economic concerns. Interestingly, some studies under this approach have also identified a relationship which suggests that there is an optimal level of environmental and social performance beyond which the corporation incurs unnecessary costs and reductions in profitability (Salzmann et al., 2005).

**Strategic CSR benefits and organizational behavior**

The findings from the second hypothesis (H2) yielded a positive and significant relationship between financial performance and the firm's organizational behavior (adj  $r^2 = 0.676$ ). The measurement of significance with organizational behavior indicated a confidence level of 95% (where  $p < 0.05$ ). The 'financial performance' is significantly and strongly correlated to 'organizational size' (t-value = 2.660), 'innovative environmental practices' (t-value = 4.096); and 'training' (t-value = -2.015). As expected, 'HR Training' had a significant and negative effect on financial performance. The following equation describes the relationship between Financial Performance and Organizational Behavior.

**Regression equation 4.**

$$H2: \text{'Financial Performance'} = \beta_0 + \beta_1 \text{'Size'} + \beta_2 \text{'Innovative Environmental Policies'} + \beta_3 \text{'HR Training'} + \varepsilon.$$

This model has confirmed that the owner-managers thought that their hotel guests were valuing the innovative environmental practices. This finding reflects the academic literature in this area of research (Ayuso, 2006). Customers are willing to pay more for products and services from socially and environmentally responsible companies (see Laroche et al., 2001). This may be also attributed to the firms' communicating their sustainability initiatives to their different stakeholder groups. There was a positive and significant relationship between effective HRM and the firm's organizational behavior (adj  $r^2 = 0.488$ ). The 'effective HRM' was significant (where  $p < 0.05$ ) and strongly correlated to 'HR dept' (t-value = 2.601), 'innovative environmental practices' (t-value = 2.664); and 'marketplace policies' (t-value = 2.347). The following equation describes the relationship between effective operational efficiency and organizational commitment between Effective Human Resource Management and Organizational Behavior.

**Regression equation 5.**

$$H2: \text{'Effective Human Resource Management'} = \beta_0 + \beta_1 \text{'HR Dept'} + \beta_2 \text{'Innovative Environmental Policies'} + \beta_3 \text{'Marketplace Policies'} + \varepsilon.$$

As expected, the presence of an 'HR department' has a significant and positive affect on 'effective HRM'. Curiously, the significance of the variables 'innovative environmental practices' and 'marketplace policies' in the model may suggest that there are many HRM benefits as a result of CSR behavior. The results indicate that the employees are committed to their hotels' sustainable environmental practices and marketplace policies. The staff's involvement in CSR engagement can lead to boost their morale, job satisfaction and loyalty to their firm. In Freeman's stakeholder model (1984, 2004) employees represent one of many other stakeholders groups addressing the company with their own demands. There are positive and significant relationships between the firm's organizational behavior and operational efficiency and cost savings with an adj  $r^2 = 0.326$ . The 'operational efficiency' is equally correlated to 'organizational size' (t-value = 3.636), and 'HR policies' (t-value = 3.635). The following equation describes the relationship between Organizational Behavior and Operational Efficiency and Cost Savings

**Regression equation 6.**

$$H2: \text{Operational Efficiency} = \beta_0 + \beta_1 \text{'Size'} + \beta_2 \text{'HR Policies'} + \varepsilon.$$

How businesses respond to the expressions of ethics and morality in markets may be triggered by a desire to avoid unnecessary costs. The different demands of stakeholders may present potential threats to the business organization. Therefore, this cost and risk reduction perspective of the CSR business case provides a plausible explanation of why businesses may try to mitigate and alleviate the threats through a threshold level of satisfactory social and environmental performance.

**Strategic CSR benefits and organizational resources**

The results from the third hypothesis (H3) have produced a positive and significant relationship

(where  $p < 0.05$ ) between financial performance against the firm's organizational resources (adj  $r^2 = 0.634$ ). With a correspondingly high t-value of 10.026, 'organizational size' has emerged as very significant in modeling the relationship between organizational resources and financial performance. Moreover, the stepwise procedure has picked up the predictor variable 'economic short-terms constraint' (t-value = 2.162). The significant t value of 'an economic short term suggests that the organizations are not investing in their long term capital investment (which comprises discretionary expenditure in CSR). Of course, this may result in more liquidity and financial resources in the short-run. The following equation describes the relationship between Organizational Resources and Financial Performance.

**Regression equation 7.**

$$H3: \text{'Financial Performance'} = \beta_0 + \beta_1 \text{'Size'} + \beta_2 \text{'Short-terms'} + \epsilon.$$

The available slack resources theory (Waddock and Graves, 1997) also assumes a trade-off view of CSR and financial performance, by suggesting that when organizations are enjoying superior performance, they are able to dedicate additional resources to CSR activities. The implication here is that the firms might perceive CSR as an additional cost and thus they can only afford to pursue these activities when they are not in a situation where they need to minimize costs. A positive and significant relationship has emerged between effective HRM and organizational resources (adj  $r^2 = 0.458$ ). In this case, the measurement of significance has indicated a confidence level of 95% (where  $p < 0.05$ ). The relationship between 'Effective HRM' and 'HR dept' was strongly correlated ( $t = 3.337$ ) and negatively correlated to 'Financial Resources' (t-value = -2.202). The following equation describes the relationship between Organizational Resources and Effective Human Resource Management:

**Regression equation 8.**

$$H3: \text{'Effective HRM'} = \beta_0 + \beta_1 \text{'HR Dept'} + \beta_2 \text{'<Financial Resources>'} + \epsilon.$$

The literature review in this field suggests that the organization's internal resources and skills are an important mediator between social performance and financial performance. Advocates of this internal resources theory claim that CSR policies increase managerial competencies. CSR helps to develop better skills and abilities to adapt to changes in the challenging business environment. Appropriate knowledge of the social and environmental performance is becoming indispensable in the hospitality industry (Tsai et al., 2010). The internal skills perspective is substantiated empirically to some extent, in this study. The findings have indicated a positive and significant relationship (where  $p < 0.05$ ) between operational efficiency and cost savings and the firms' resources (adj  $r^2 = 0.213$ ), where 'size' (with a t-value of 4.176) and 'HR department' (t-value = -2.201) were the predicting variables. Surprisingly, the presence of an HR department was significant where it emerged that it has negatively affected operational efficiency. The following equation describes the relationship between Organizational Resources and Operational Efficiency and Cost Savings.

**Regression equation 9.**

$$H3: \text{'Operational Efficiency'} = \beta_0 + \beta_1 \text{'Size'} + \beta_2 \text{'<HR Dept>'} + \epsilon.$$

**Does CSR engagement bring economic value?**

The next model attempts to explain the causal mechanisms which may determine financial performance. This time, a myriad of variables (and factor components) have been taken into account, in order to come up with a plausible 'causal path' (Granger, 1980). Therefore, 'organizational commitment', 'organizational behavior', 'organizational resources', the 'societal engagement' components, 'Size' and 'HR Department' were inserted in the regression model. Again, a stepwise entry procedure ensured the selection of the significant predictor variables which exhibited the highest bivariate correlation with 'financial performance' (and excluded other insignificant variables). This fourth hypothetical model (H4) has yielded a strong correlation coefficient (adj  $r^2 = 0.769$ ). This relationship was significant (where  $p < 0.05$  level). According to this model; the 'financial performance' is preceded by 'size', 'community relations', 'innovative environmental practices' and 'regulatory relations'. The following equation features the antecedents for 'Financial Performance'.

**Regression equation 10**

$$H4: \text{'Financial Performance'} = \beta_0 + \beta_1 \text{'Size'} + \beta_2 \text{'Community Relations'} + \beta_3 \text{'Innovative Environmental Policies'} + \beta_4 \text{'Regulatory Relations'} + \epsilon.$$

It transpired that the financial performance is dependent on its 'size' with a t-value = 2.535, 'societal relations' (t-value = 5.764), 'innovative environmental practices' (t-value = 3.388) and 'regulatory relations' (t-value = 2.347). Interestingly, the organizations' ability to build stakeholder relationships has resulted as a precursor for the organizations' financial performance. Such empirical studies were carried out in the past to investigate the relationship between CSR (corporate social performance or corporate citizenship) and financial performance. Previous empirical results have ranged

from negative relation (Wright and Ferris, 1997), to no relation at all (Mc Williams et al., 2000), to showing a positive relation (Orlitzky et al., 2012; Waddock and Graves, 1997).

#### **What creates shared value?**

The fifth hypothetical model features the societal relations (CSV1) as the dependent variable. The model has produced a strong correlation coefficient (adj  $r^2 = 0.645$ ) which was statistically significant ( $p < 0.05$ ). The independent variables which have significantly explained a large portion of this variation consisted of the organizations' 'financial performance' (were  $t = 7.206$ ), 'financial resources' ( $t = 5.117$ ), 'training' ( $t = -3.720$ ), 'marketplace policies' ( $t = -2.878$ ) and 'time resources' ( $t = 2.457$ ). Interestingly, the organizational behavior explanatory variables have resulted in a negative effect on societal relations. The reason for this is that businesses may devote their slack resources on training their staff and on marketing and promotion activities rather than strengthening the ties with the community around the business. This finding indicates that businesses tend to look after their customers and suppliers first. The following equation describes the causal model for societal relations.

#### **Regression equation 11.**

H5: 'Societal Relations' =  $\beta_0 + \beta_1$ 'Financial Performance' +  $\beta_2$ 'Financial Resources' +  $\beta_3$ '<Training>' +  $\beta_4$ '<Marketplace Policies>' +  $\beta_5$ 'Time' +  $\varepsilon$ .

There was also a positive and significant relationship when regulatory relations (CSV2) was the response variable. In this case, there was a moderate correlation coefficient with an adj.  $r^2 = 0.423$  at a highly significant level ( $p < 0.001$ ). This second H5 model shows that the 'regulatory relations' are dependent on the 'organization size' ( $t = 7.138$ ). It transpires that the larger firms tend to build closer relationships with the government and its agencies. This finding was also reflected in the literature review (see Albareda et al., 2004). The following equation features the stepwise regression equation for regulatory relations

#### **Regression Equation 12.**

H5: 'Regulatory Relations' =  $\beta_0 + \beta_1$  'Size' +  $\varepsilon$ .

#### **Does doing well, lead to doing good?**

So far the findings indicated that organizational commitment, behavior, their slack resources and size are the causal determinants. Therefore they are the temporal antecedents of financial performance. Curiously, there are many theoretical arguments in literature which suggest that financial performance can be the precursor of organizational behavior (for CSR). The rationale for reverse causation may be triggered from the firms' availability of slack resources. Orlitzky et al. (2003) have supported this view of reverse causality from financial performance to CSR (they used the notion Corporate Citizenship). Similarly, Waddock and Graves (1997) found that Corporate Social Performance (CSP) depends on financial performance, and that the sign of the relationship was positive. The sixth hypothetical relationships between the 4 organizational behavioral components against 'financial performance' have been tested using regression analysis' stepwise procedure. There was a strong correlation coefficient (adj  $r^2 = 0.603$ ) and it was highly significant (where  $p < 0.001$ ) between 'innovative environmental practices' (dependent variable) and 'financial performance' ( $t = 10.291$ ). This strong relationship suggests that when an organization achieves sound financial results it tends to invest in innovative environmental practices, such as 'energy and water conservation', it may engage in 'environmental protection' measures, 'waste minimization' and the like (see Dodds and Kuehnel, 2010; Graci and Dodds, 2009; Merwe and Wöcke, 2007). The following regression equation describes the causal model where Financial Performance is the antecedent of Organizational Behavior:

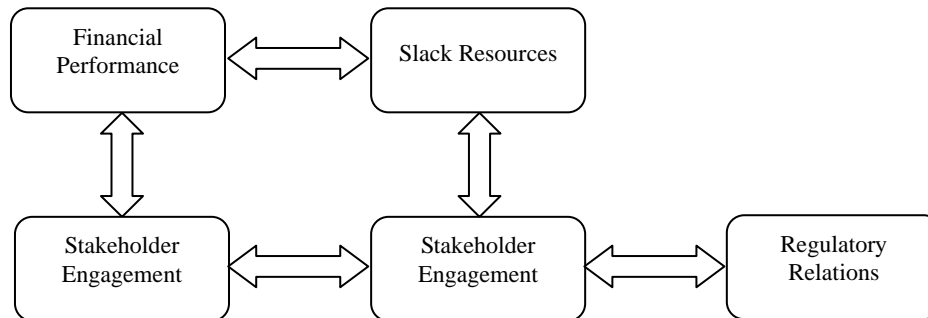
#### **Regression equation 13.**

H6: 'Innovative Environmental Behavior' =  $\beta_0 + \beta_1$  'Financial Performance' +  $\varepsilon$ .

In good economic times, the high levels of 'financial performance' may provide the slack resources which are required to successfully engage in CSR (refer to Ullmann, 1985). The availability of excess funds will determine whether there is the 'initiation and maintenance of voluntary social and environmental policies' (McGuire et al., 1988). If the firm has experienced low profits and has scarcer resources at its disposal, then the firm may not engage itself in CSR activities and investments. On the other hand, if the organization has gone through a period of consistent satisfying results with good financial performance, businesses may exhibit a sense of obligation to give something back to the community (economist, 2006). The relationships between 'financial performance' as a predictor variable against the other behavioral outcome variables (namely, 'HR policies'; 'Training' and 'Market relations') did not yield any positive and significant relationships. In this case, the findings suggest that successful financial performance, does not necessarily translate in significant improvements in the businesses' human resources and marketplace policies; such as training and development of staff, better customer

services and fruitful relationships with suppliers and the people they do business with.

An extensive literature review about business models has confirmed that responsible behavior can be used as a strategic tool for value creation (see Orlitzky et al. 2012; Husted et al. 2012). A conceptual model may lead towards achieving a competitive advantage of the firm, if the model is sufficiently differentiated (see Teece, 2010). Following the sound empirical findings in this thesis; a model representing the 'creation of shared value' is being proposed and is depicted hereunder:



**Figure 1** 'Creating Shared Value' Model (Compiled by the Author)

According to the stakeholder theory, there are win-win outcomes when businesses connect with their stakeholders. Firms create simultaneous, pluralistic definitions of value whilst targeting their multitude of stakeholders. In a similar vein, the resource based view (RBV) theory suggests that resources of the firm affects its activities and growth (Penrose 1959), profits (Wernerfelt 1984) and the level of sustained competitive advantage (Barney 1991). Significant areas of study which are gathered under this business case approach of CSR include: 'sustainable local enterprise networks' (Elkington, 1998); 'value based networks' (Wheeler et al. 2003); 'positive synergy' or the 'virtuous circles' (Pava and Krausz, 1996; Preston and O'Bannon, 1997; Stanwick and Stanwick, 1998); 'societal learning' (Brown and Ashman, 1998); 'creating shared value' (Porter and Kramer, 2006, 2011; EU, 2011); 'value in business' (Lindgreen et al. 2012); 'value creation through social strategy' (Husted et al. 2012) and 'the stakeholder approach to maximizing business and social value' (Bhattacharya et al., 2012). The fundamental motivation of such approaches is the view that creating connections between stakeholders will open up unseen opportunities for value creation.

## 6 Discussion and Conclusions

The quantitative analysis revealed that CSR engagement translates to better organizational performance. It has been reported that there is more to CSR behavior than boosting the employee morale and increasing employees' job satisfaction. The hotel enterprises indicated that they are engaging themselves in innovative environmental practices, as they realized that there are cost saving opportunities for them. It has been demonstrated that CSR engagement improves the financial performance of the business. The socially responsible behavior coupled with the environmental performance often elicits greater customer and employee loyalty, as it simultaneously improves the existing societal relationships, including the regulatory ones. The discretionary spending in CSR whether it is driven from a strategic intent or from 'posturing behavior', often results in improved relationships with internal and external stakeholders.

In the main, the informants have indicated that strategic corporate social responsibility yields substantial benefits to the firm itself as it supports the core business activities. This research found that the firm's financial performance is dependent on the firm's organizational behavior for CSR engagement. Interestingly, it also emerged that the financial performance is also dependent on the firm's size and with its capability to forge good community and regulatory relationships. This quantitative study suggests that CSR (when manifested as environmental behavior) is dependent on the firm's financial performance and vice-versa. Both relationships  $CSR \rightarrow FP$  and  $FP \rightarrow CSR$  were strong and significant, when tested statistically. Therefore, this study has shown that CSR behavior causes financial performance and in turn financial performance causes CSR behavior. This finding also supports the slack resources theory. When there are available resources (financial and time resources) the businesses have greater freedom to spend in discretionary activities. Firms may choose to invest their slack resources on strategic CSR, at the same time they will be 'doing good by doing well'.

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## Research on Synergistic Innovation Mechanism of Industry Technology Innovation Strategic Alliance: A Case Study of FTTx\*

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**Abstract:** With the increased development of international industrial competition and growing demand of technology innovation, innovation strategic has trended to become kinds of systems of cooperation or alliance in regional industries. This thesis tries to research the synergistic innovation mechanism from the view of knowledge transfer and the case analysis of FTTx industrial technology innovation strategic alliance of Hubei province. To point out the innovation process and mechanism principles of alliance can help to know further about operating management of innovation activities.

**Key words:** Synergistic innovation; Industry technology innovation strategic alliance; Knowledge transfer; Innovation mechanism; Conceptual model

### 1 Introduction

At present, industrial technology innovation strategic alliance construction in China has made great achievements: each regional alliance improved integrated innovation with industrial technology innovation chain, and it promoted their industrial core competitiveness; At the same time, each alliance held national or provincial science and technology projects, developed common key technology research and development, the technology innovation mechanisms promoted the foundation and share of alliance platforms or bases and they also affect optimal allocation of the innovation elements; The alliances focused on exploring their own characteristics and different operation mode that can strengthen themselves cooperation. Innovation alliances in the national innovation system play a great role in industrial technology innovation. Most importantly they cannot neglect the efficacy from synergistic innovation mechanism.

The concept of synergy has already appeared in last century from the theory of economic management, now it gradually spreads into innovation research and synergistic innovation plays an important role in this field. The earliest synergy research is from Ansoff when he studied enterprise diversification.<sup>[1]</sup> In 1971 the German researcher Haken discussed the systematology, then he thought if each subsystem of the whole system could have the characteristics of intercoordination, cooperation, synchronous joint and collective behavior, then it will get the "1+1>2" synergistic effect. The definition of synergy is: different subsystems will structure a kind of function architecture with the macro level time and space. In self-organizing theory synergy was thought as a tool which could realize self-organizing; it emphasizes the interaction between system and function that will have the structural effect.<sup>[2]</sup> In addition American, Japanese and other scholars also discussed and put forward coordination mechanism and the synergy management.

For synergistic innovation, nowadays the third generation of technology innovation theory said that technology innovation needs stronger support as the background which could build a great environment for it. So the views are focused on the internal or external factors of innovation interaction which includes institution, support system and so on, as Feedy proved in empirical way that the institution and innovation have interaction between them. B·A·Lundvall in national innovation system theory said that, industry, university and research institute which are the foundation factors are the core of national innovation system. For the factors of innovation organization, the scholars have common ideas.<sup>[3]</sup> Xiong Li and Sun Youxia (2011) separated the present ideas into two parts, which are internal innovation and external innovation, according to the different realizing approaches. The external innovation is also separated into transverse and longitudinal parts. According to the comprehensive research most of scholars thought the main factors of synergistic innovation include technology, marketing, university, enterprise, research institute and so on. The support factors, such as government, also help and take part in operating process.<sup>[4]</sup>

For the mechanism of industry technology strategic alliance, it is a kind of contract relationship, the alliance is not a legal person, but nowadays laws or rules could restrict its behaviors. Though the

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guidance from series of contracts, alliance can ensure the operation of investment systems, interest distribution systems and so on. He Yubing (2012) constructs industry-university-institute cooperation system from thinking of levels of strategy, knowledge and organization, by this way it was analyzed the internal cooperation and all-win processes.<sup>[5]</sup>

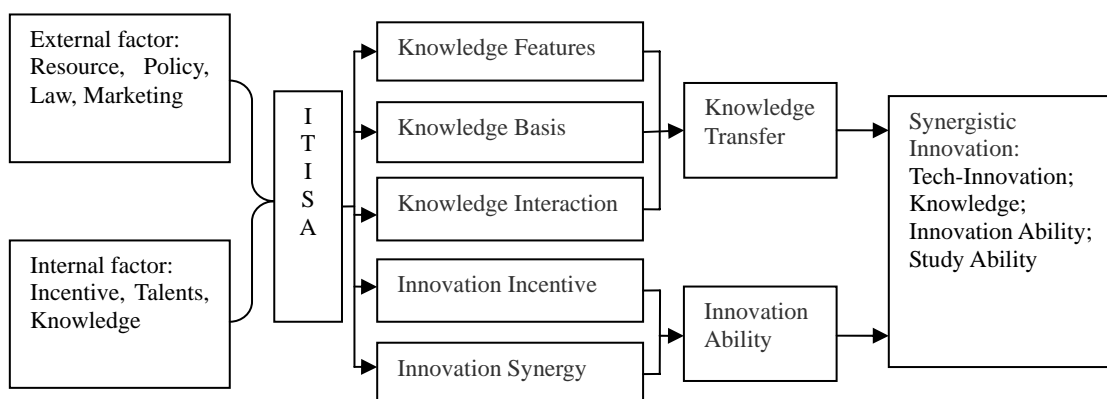
Industrial Technological Innovation Strategic Alliances not only acquire new knowledge by knowledge transfer, but also obtain synergistic innovation effect by the interactions among research universities, research institutes and enterprise knowledge subsystem. Knowledge transfer mentioned above is the premise and foundation of synergistic innovation, which promotes knowledge transfer in return. Process of synergistic innovation accompanies knowledge transfer. They interact with each other, creating conditions for generation and update of the core competencies of the organization. Around the knowledge transfer theory perspective, this paper further constructs the industry technical alliance of synergistic innovation mechanism.

## 2 Synergistic Innovation Mechanism of Innovation strategic alliance

Synergistic innovation in industrial technology innovation strategic alliances can be influenced by various factors, including science, technology, economy, society, policy and the interest of cooperators. We establish the industrial technology innovation strategic alliances mechanism in combine with the current situation of Hubei province and the existing theories foundation. The model divides all the factors which determine and influence synergistic innovation into two parts-internal and external ones, emphasizing that synergistic innovation is the result of both the internal and external factors and showing the dynamical complexity of the synergistic innovation process. The improvement of university and research institutes and core competencies of the organization in the alliances depends on the improvement of performance of synergistic innovation between them. Both of them enhance their technical and learning abilities, expand the knowledge base, strengthen sustainable innovation, and promote the formation and development of core competencies in the end.

The following Figure (see Figure1) shows the synergistic innovation mechanism of industrial technology innovation strategic alliances. The performance of synergistic innovation is influenced by the following factors:

- (1) Knowledge storage of university, research institutes and enterprises, which is prior knowledge;
- (2) Interact knowledge transfer ability of university, research institutes and enterprises, including acquisition and transmission ability;
- (3) Features of knowledge, which is mainly the complexity of knowledge;
- (4) Creation impetus of university, research institutes and enterprises, mainly considering the rational allocation of the alliances etc;
- (5) Innovation ability of university, research institutes and enterprises, mainly referring to the quality of employees etc;
- (6) Synergistic status of university, research institutes and enterprises, mainly concerning the synergistic status of cultures, targets, employees and management in the alliances;



**Figure 1 Industry Technology Innovation Strategic Alliance Synergistic Innovation Mechanism**  
 (Notes: ITISA is the abbreviations expression of Industry Technology Innovation Strategic Alliance.)

According to the analysis above, it can be proved that the knowledge complementarities is the

condition of forming synergistic innovation and produces obvious performance in the alliances, which improves the abilities of technical innovation and knowledge accumulation, shortens the innovation cycle time, and then gains competitive advantage.

### **3 The Case study: FTTx Industry Technology Innovation Strategic Alliance**

#### **3.1 Brief Introduction of FTTx Industry Technology Innovation Strategic Alliance**

Before 2008, the gap of FTTx (Fiber to the Building) industry is huge between China and other foreign countries. Back then, the FTTx coverage in developed countries is from 20% to 40%, while it is less than 2%; there is a large proportion of FFTH (Fiber to the Home) in developed countries, while among the only 2% in China, there is a small proportion of relatively larger commercial FFTH application mode. At present, we have 1.1 billion telephone subscribers and 0.45 billion internet users. As an important component of a new generation of information technology, the rapid development of FTTx and WBN (Wide Band Network) which is centralized by FTTx, will drive the development of a strategic emerging industry which is of a scale of one trillion RMB. Therefore, a national alliance was formed---FTTx industrial technology innovation strategic alliances, which includes 12 core members---Wuhan Research Institute, China Academy of Telecommunication Research, China Telecom, China Mobile, China Unicom, Huawei Technologies, ZTE, PTIC, and Balefire communication etc, and 30 peripheral members. It is the first alliance in China committed to popularize WBN, develop the "triple play" and promote the construction of technology innovation chain of broadband industry.

Since the establishment of the alliance, its members cooperate actively, strive for innovation and do a lot of works to perfect the industry standardization, achieving good results:

(1) Its members supported the standardization of the alliance by implementation traction and technology diffusion. To be specific, on the basis of "Coalition Agreement" and "Alliance Cooperation Management Approach", the members carried out a great number of innovative collaboration activities, for example, together with WTD, HUST, Wuhan Light-science and Technology company researched and developed key optoelectronic devices to lower the cost of optical fiber access devices, trying to make it to 20% by 2012; YOFC and Balefire communication together researched and developed new optical fibers (such as UBIF) and supporting optical fiber perform suitable for FTTx; together with Balefire communication, China Academy of Telecommunication Research etc., YOFC researched and developed new optical fibers (such as feeder cable, optical distribution cable, and GJXH etc.); they also started a series of cooperative innovation activities in the respect of integration of broadband fiber access and wireless technology.

(2) Its members worked in cooperation with each other to get international standard in the field of FTTX, leading the development of domestic industry; they formulated a series of national and industrial standards, promoting the standardization in FTTx in China thoroughly.

(3) The alliance co-held FTTx development strategy meeting with China Institute of Communications every year since its establishment; the "FTTX technology and standard workshop" co-held with China Institute of Communications systematically trained over 2000 FTTx research staff, providing a firm talent resource foundation for standardization of FTTx in China.

The excellent results closely related to the base work and the internal mechanism of the alliance. On the one hand, based on the alliance agreements, the alliance provides for the objectives and tasks of the member units of the standardization work and provides the basis for the work and system support. Specifically, when the alliance is established, the agreements units confirm:"continuously improve our standard system of the FTTx, ensure the interconnection of the independent intellectual property rights FTTx solutions, collaborative research and improve the standard system of the FTTx, before 2010 it completed the study work of the FTTx national institute of standards. Industry and information technology ministry of telecommunications research institute, as the main focal points, complete the study work of the FTTx national institute of standards before 2010."

#### **3.2 Enlightenments of FTTx Alliance**

FTTx Industry technology innovation strategic alliance, from the beginning of set up to now, has made the good progress and achievement, synergistic innovative experience is worth to learn from it:

(1) Megamerger of alliance members. 12 core members and more than 30 peripheral members of the alliance have included, for domestic, the most innovative and influence research, manufacturing companies and telecom companies in the Devices, optoelectronic devices, fiber optic cable and other areas of the optical access system, Alliance members represent the highest level of the corresponding areas of innovation within. The lead unit of the alliance that is the Union Fiber Home Technologies

Group is a conversion from the enterprise by the Wuhan Institute of Posts and Telecommunications Group, is considered the birthplace of the Chinese optical communications industry, According to statistics, in China's communication network, 2.5 km out of 9 km fiber optic cable is developed by the Wuhan Institute of Posts and Telecommunications, and 3-5 km from its technical support corporate. The Alliance is a veritable "Megamerger". In 2010, the main business of Alliance member companies total revenue of more than 1.5 trillion RMB, accounting for more than 90 percent of the owners of information and communication business revenue.

(2) Complement each other's advantages among members. For each company's own technical secrets, their core competitiveness, through the differentiation advantages of technological innovation, utilization of resources, and the alliance carried out joint research projects to achieve the same purpose, and share knowledge and technology, and made full use of resources. In addition, in order to strengthen the co-operation of the project members, on the one hand, the alliance start the project enlists that is Member units of the Ministry of Industry and Telecommunications Research Institute, China Unicom, China Mobile and other feedback nearly 10 project proposals, on the other hand, according to the demand for industrial development, alliance members jointly apply for the National Science and Technology project. Dividing work, complementing each other in project cooperation, and get the "1+1>2" achievement at last.

(3) Regulating the alliance cooperation system based on the internal mechanism. The internal mechanism of alliance is "one line" and "standard link", "one line" means the standard work that strive to get the international standard discourse; "Standard link" means to strengthen cooperation innovation, through the upstream and downstream of the industry chain close communication; to accurate positioning demand, through project promotion. In the project cooperation process, the alliance gets the agreement as a foundation. To specify the members of different stages of objectives and tasks of standardization work in agreements, and to regulate the members' responsibility and obligation which effectively provide strategic basis and system support for alliance operation.

#### 4 Conclusion

FTTx alliance is one of 36 industry technology innovation strategic alliances experimental units which are replied by the ministry of science and technology. These years it has made the good progress and achievement, especially on synergistic innovation. This thesis tries to research the synergistic innovation mechanism from the view of knowledge transfer and the case analysis of alliance. Compared with enterprise independent innovation, shared knowledge base in synergistic innovation makes the enterprises meet complex problems and source of knowledge they haven't met before, in this way, making economic effect increased to a new level significantly and core competencies of organization enhanced.

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# Building a Collaborative Innovation Strategic Alliance and Exploring New Modes for Industry-University-Institute Cooperation: Take Wuhan University of Technology, P. R. China as an example

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**Abstract:** The industry-university-institute cooperation cannot play the due role in boosting innovation unless it is launched in an effective mode in this paper, profound studies and analyses have been conducted on the practice, effect and experience of the new industry-university-institute cooperation mode on the basis of the exploration and practice of “The Strategic Cooperation Alliance on the Research of Glass Technology” and “Green Transport Alliance” of Wuhan University of Technology, China, which gives full play to the strengths of education and technology, and puts forward the thinking of building a collaborative innovation strategic alliance on the principle of mutual benefit in terms of industry leading, government leadership, mechanism innovation, project actuation and platform support, providing a beneficial reference to universities in terms of industry-university-institute cooperation.

**Key words:** Collaborative innovation; Strategic alliance; Industry-university-institute cooperation; New mode

## 1 Introduction

To carry out the spirit of the important speech made by State President Hu Jintao at the 100-Year Anniversary Celebration of Tsinghua University, on May 2012, the Ministry of Education of China launched the “University and College Innovation Capability Improvement Plan” (i.e. the “Plan 2011”). The direct carrier to implement the Plan 2011 is to build a collaborative innovation strategic alliance, to innovate the organization mode of industry-university-institute cooperation, to solve problems in the building of technological innovation system, and to boost the building of an innovative country.

Due to the dispersion, repetition and inefficiency in innovation power of China for a long time, personnel training and scientific research are divorced from economic and social development, and the major gap between China and the developed countries is the deficiency of innovation.

According to the global experience in the industry-university-institute cooperation, to cope with the rapid changes of technology and market, cooperative innovation has become the main measure that European, American and Japanese universities and colleges, research institutes and enterprise are adopting to deal with the uncertainty of innovative technology and market. Relying on colleges and universities, collaborating with research institutes, industry enterprises, local government and the international community to form the whole collaborative innovation and to solve the national demands and important scientific problems is not only an effective way to promote national innovation, but also proved by many domestic and foreign cooperative innovation practice. In the 1990s, the policy makers in USA began to encourage universities cooperate with enterprises in technological development, and tried to use a series of plan (such as “a national center plan to promote the development of manufacturing industry science”, “human genome atlas plan”, etc) to strengthen the innovation ability of synergy between universities and enterprises conditions<sup>[1-2]</sup>. For scientific research and technology development, the United States has always been pursued free policy. 60s was the golden age when government was in charge of science and technology development, and gradually formed the science and technology system at current United States whose main body is scientific research institution of the university. The following is the scientific research system structure sheet (table 1).<sup>[3]</sup>

**Table 1 U.S. Science System Structure**  
(Expenditure Ratio in 1992)

	University	National Laboratory	National Research Center of the Entrusted Management	Enterprise	Nonprofit Research Institutions
basic research	50.9	11.1	11.1	18.5	8.5
application research	13.1	11.8	2.7	67.5	4.9

Technological innovations are raising new innovative requirements for the combination methods of technological innovation elements, and need to be improved continuously in practice on the basis of national conditions<sup>[4]</sup>.

Only in the effective mode can the industry-university-institute cooperation be important to promote innovation<sup>[5]</sup>. Wuhan University of Technology regards serving regional and industrial economy as its duty, and positively explores the new industry-university-institute collaborative innovation cooperation mode.

Building a collaborative innovation strategic alliance should focus on the reform of the mechanism system and on promoting the integration development inside and outside colleges and universities. Establishing cooperative innovation mode strives to solve the inharmony between the innovation chain and innovation management. In 2006, the university built, together with Shahe, Hebei, China, a high level generic technological innovation service platform—the Glass Technology Research Institute (Research & Development Center), absorbed enterprises and made up a “Glass Technology Research Strategic Cooperation Alliance”. In 2012, the university held the hands of 21 universities and colleges, scientific research institutes and large enterprises at home, building the “Industry-university-institute Collaborative Innovation Alliance of Green Transport Technology” (Called “Green Transport Alliance” for short). The Green Transport Alliance has been crowned with success in boosting the close linkage among education, science and technology, and economy.

## **2 Building a Collaborative Innovation Strategic Alliance**

Wuhan University of Technology and Shahe Municipal Government of Hebei Province entered into the “Glass Technology Research Strategic Cooperation Alliance” with local enterprises by building a high level generic technological innovation service platform, i.e. Glass Technology Research Institute. This is a form of collaborative innovation that the university has made in the exploration of cooperative mechanism centering on the improvement in the training of outstanding talents, technological innovation, and the great demands in the building material industry, as well as serving the development of regional economy. The alliance gives full play to the characteristics of material disciplines and the talent advantage of university. On this basis, it focuses on the urgent need of transformation and upgrading of the characteristic glass industry of Shahe City.

The “Green Transport Alliance” built under the leadership of China - Wuhan University of Technology establishes the collaborative innovation target system based on the “Green Development” in close accordance with the major strategic demands on green transport, which involves establishing green transport discipline and the direction of key technical breakthrough, training and gathering innovative talents supporting green transport, improving industry culture and policies, and building an industry-university-institute collaborative innovation support platform. A new collaborative innovation system and mechanism has been built based on mutual benefit. This brand-new alliance organization has realized comprehensive collaboration and profound integration by the traditional industry ties and the core value of green development, as well as the combination and unification among “segment management”, “plan and market”, and “science, education and economy”.

## **3 Fruitful Results from the New Mode**

Through years of exploration, the new industry-university-institute cooperation mode built jointly by Wuhan University of Technology and Shahe City in Hebei Province has achieved remarkable results in serving local economy, enterprise development, talent support, and the development of university in itself.

### **3.1 Enhancing local economic development**

Shahe Glass Technology Research Institute in Hebei Province has directly provided fast and effective services in the transformation and upgrading of the glass industry in terms of technology, talent, equipment and brand closely specific to the bottlenecks and technical difficulties in the development of the glass industry of Shahe City. Since 2005, the Glass Technology Research Institute has extended assistance in succession in the development of Glass Industry Development Plan of Shahe City and 2011-2020 Regional Economic Development Plan, etc., helped to bring about the successive operation of a number of high-tech quality float glass production lines in Shahe City, pushed the upgrading and transformation of the glass industry, and helped to increase the industrial benefits substantially. In 2011, Shahe realized the annual output 0.12 billion weight cases, with production value RMB 21 billion, and



paid taxes RMB 600 million about 20 times more than that in 2005.

### **3.2 Enhancing the technological innovation capability of the industry**

Shahe Glass Technology Research Institute has successively helped Shahe Yingxin Glass Group Co., Ltd., Jinhongyang Company, Chirun Special Glass Industrial Park introduce a number of high-tech projects, which enriched the types of glass products, extended the industrial chain, and enhanced the development momentum of glass enterprises. In 2011, the production capacity of quality float glass increased from 9% in 2005 to 85% of total output of glass all over Shahe City. The rate of further processing of glass rose from 25% to 32%.

### **3.3 Extending talent and intellectual supports in the locality**

Wuhan University of Technology provided all-round talent guarantee to Shahe City via Shahe Glass Technology Research Institute according to the actual needs of key areas and weak links of the talent training and the development of Shahe City, Hebei Province of China. (1) Provide 3,860 person-times of post training totally to the glass industry of Shahe City by the direct training, special training, and irregular seminars, and training the party and government management personnel and executives of key enterprises of Shahe City about specialized and business knowledge, enhancing and developing their insights and management capabilities in the economic and social development. (2) Carry out the joint education, building a modern distance education study center and a continuing education correspondence coaching center in Shahe City and training local technical personnel in Shahe City. (3) Provide on-the-job service. A youth teacher each year will be designed to take a temporary post in a government department or an enterprise of Shahe City and to give guidance and have a physical training.

### **3.4 Boosting the development of the universities**

The university has undertaken diversified projects of the glass industry of Shahe City since 2005. Multiple scientific research results have been transformed and put into production. The university built a “Graduate Scientific Research Innovation Base” and an “Outstanding Engineer Training Base” in Shahe City. The university will assign a number of teachers and students each year to the Glass Technology Research Institute, where they will take part in the research and development by the good practicing and experimental conditions, and the pilot base. It will help to improve students’ innovation capability as well as teachers’ practical ability. In the process of serving local economic and social development, a number of research results, technologies and talents go out of the university to enterprises, helping to enhance the university’s capability in the scientific research and development and in the transformation of scientific results, as well as the reputation of the university greatly.

The “Green Transport Alliance” has just been put into operation at present. It is believed that it will make positive contributions to the transformation of the development mode of China’s transport industry, as well as the strategic adjustment of economic structure.

## **4 The New Mode’s Benefits**

### **4.1 The foundation of the new mode**

The glass industry, which is a characteristic industry of Shahe City, Hebei Province of China, contributes 20% of the total plate glass to China. But the glass industry of Shahe City is faced with the reality in urgent need of upgrading. The transportation industry of China starves for the building of low-carbon transportation system and the green development of the transportation industry. Wuhan University of Technology has resource advantages in the area of traditional materials, new materials new energy resources and equipment manufacturing and has obtained a series of achievements. The 21 members of the “Green Transport Alliance” have gathered multiple national key disciplines, research platforms, talents and other innovation resources in direct relation to the transportation industry, and have been extending supports to talent training and technological innovation in the transportation area. The glass industry of Shahe City, the technical demand of China’s transportation industry and the characteristic advantageous disciplines of Wuhan University of Technology are highly coincident, thus having laid a solid foundation for the establishment of the new industry-university-institute cooperation mode.

### **4.2 Government leadership in the new mode**

Shahe Municipal Government in Hebei Province, China attaches great importance to the building and development of Shahe Glass Technology Research Institute. Mayor of Shahe Municipal Government assumes the office of director of the Research Institute Management Committee to coordinate, plan and push concerning work on the whole. The municipal government invested over

RMB 70 million in building the Glass Technology Research Institute, purchased the domestic best and the world advanced scientific research equipment, and offered favorable policies in the land, funds, and talent introduction, etc., thus playing a critical role in the establishment of the industry-university-institute cooperation mode. The “Green Transport Alliance” is subject to the management of the council under the Ministry of Transport of P.R.C., the Ministry of Education and the Ministry of Science and Technology, deals with issues relating to the long-term, overall and strategic development of green transportation industry, establishes the main direction of attack and key tasks of the alliance in different periods, and gives instructions and supports to the collaborative innovations of the alliance.

#### **4.3 The core of the new mode**

The “Green Transport Alliance” has built a collaborative innovation system and mechanism based on mutual benefits, an inner motivation mechanism centering on market adjustment (Including a brand-new collaborative technological innovation mechanism, an innovative talent training mechanism and a talent management mechanism), and a cooperation exchange mechanism based on overall opening. The alliance is fully open inside and outside, and has realized all-round communication, resource sharing, risk sharing, combination of brainstorm, and collaborative innovation. Shahe Glass Technology Research Institute has established a “three-four-three” cooperation and development pattern in the operation, i.e. “three promotion mechanisms” (i.e. input, plan and policy), “four supporting systems” (i.e. first-class technology, talent, equipment, and brand), and “three cooperation modes (i.e. pushing independent operation of consulting, decision-making and executive institutes, building a glass technology alliance to push collaborative innovation, and building a technology application demonstration zone).

#### **4.4 The key point of the new mode**

Shahe Glass Technology Research Institute in Hebei Province regards the basic research on the application of glass, and technical transformation as the main direction of attack, and researches and develops, on the leading edge of glass material science, the key production technology and new types of glass, new energy based glass technology, production process and equipment and automation emulation techniques, key energy saving and emission reduction techniques of the glass industry and technique assessment, and product defect quick diagnosis and analysis. The “Green Transport Alliance” regards the three scientific areas (i.e. green water transport, green land transportation, and green navigation) and key technologies as the main directions of attack, carries out project cooperation, and strives to make technological breakthrough centering on major fundamental, prospective and strategic issues in relation to green transportation.

#### **4.5 The guarantee of the new mode**

The Glass Technology Research Institute as a high-level generic technological innovation service platform jointly built up by China - Wuhan University of Technology and Shahe City in Hebei supports the industry-university-institute cooperation of the “Glass Technology Research Strategic Cooperation Alliance” comprised of the university, local government and enterprises. The “Green Transport Alliance” is to build a world first-class technological innovation platform, including a collaborative innovation platform for the major basic research and major basic research on the application, a collaborative innovation platform for the major key generic technology research and development, and a collaborative innovation platform for the transformation of major scientific and technological achievements. It is to build a world first-class innovative talent training experimental site, a green transportation-oriented comprehensive culture and policy research platform, and a strategic consulting platform to ensure the continuous effective operation of the alliance.”

## **5 Conclusion**

Wuhan University of Technology, China, has worked out a new mode of industry-university-institute cooperation by organizing the “Glass Technology Research Strategic Cooperation Alliance” and the “Green Transport Alliance”, by reforming and innovating talent training mode and mechanism and research organization mode, and by establishing major research and application platform based on multidisciplinary, team collaboration and technology integration, thus having achieved favorable economic and social effects, boosted the short-term, loose and single cooperation to transform into the long-term, close and systematic industry-university-research cooperation. Thanks to the new cooperation mode, there could be a win-win situation between various parties; and such a mode can be used for reference by other universities and colleges for purpose of

industry-university-institute cooperation.

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## Industry-University-Research Teaching Mode of Real Right Law Course\*

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**Abstract:** Industry-University-Research teaching mode is not only beneficial to improve students' practical ability, but also for scientific research to serve the society better. Literature research method and investigation method are used in this paper. This article takes the connotation of Industry-University-Research teaching mode as the breakthrough point, and put forward the specific ways and methods of Industry-University-Research teaching mode of real right law, and analyzes the practical significance of the teaching mode. The results reveal that the Industry-University-Research teaching mode is the development direction of the real right law teaching activities.

**Key words:** Real right law course; Industry- University-Research; Teaching mode; Literature research method; Investigation method

### 1 Introduction

Industry-University-Research teaching mode is derived from "Cooperative Education", which was presented by Herman Schneider in University of Cincinnati in 1906, and the theoretical study of a climax was appeared in the 1980s. The main contribution includes: "Actions to strengthen university-industry cooperation" written by Duncan Davies (Duncan Davies, 1983), and "Industry-Government-University cooperation to establish CIM education in the USA" written by G. Koves. (G. Koves, 1990) In recent years, the research on combination of Industry- University-Research is more refined. "Triangular spiral theory" is put forward by Loet Leydesdorff and Henry Etzkowitz. (Loet Leydesdorff, Henry Etzkowitz, 2001) In china, the combination of Industry- University-Research began in the "enterprise-university-institute united project", which is organized by Ministry of Foreign Economics and Trade, Ministry of Education and Chinese Sciences Academy. After 20 years of hard work, the study of the combination of Industry- University-Research gradually forms the system, the relevant works springs up.

For many years, worldwide scholars have developed a lot of Industry-University-Research teaching modes. At present, the Industry-University-Research teaching modes mainly include Two-Way Education System, Sandwich Education, Warwick Model, etc. But it is of few studies about the Industry- University-Research teaching mode of real right law. This paper put forward teaching mode of real right law course based on Industry- University-Research.

### 2 The Connotation of Industry-University-Research Teaching Mode of Real Right Law Course

Industry-University-Research teaching mode of real right law course is the mode of higher education, which is centered by cultivating students' comprehensive qualities and professional qualities, and effectively uses the different education resources and environments of universities, legal practice units and law research institutions, and organically combines school education and legal practice activities together.

"Industry" mainly refers to legal practice unit, and it mainly includes the courts and procuratorates, law firms, legal service center, etc. It is the unit that is able to turn real right law theory into practice. "Industry" is the key link of Industry-University-Research teaching mode. This link not only enhances the students' practical ability and employment competitiveness, but also increases the economic efficiency, for theoretical innovation and application to lay corporeal foundation. "University" is the real right law teaching activity in school, that is, the process of teacher to teach students about the basic principle. It is the basic link of Industry-University-Research teaching mode. This link provides the essential real right law basic rules to practice. "Research" is a law research organization, which explores the theory of real right law rules, studies on the latest problem of this subject. Subject to make the

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students participates in the whole process of scientific research, cultivates the students' creativity and promotes the development of the real right law theory. It is the important guarantee of Industry-University-Research teaching mode.

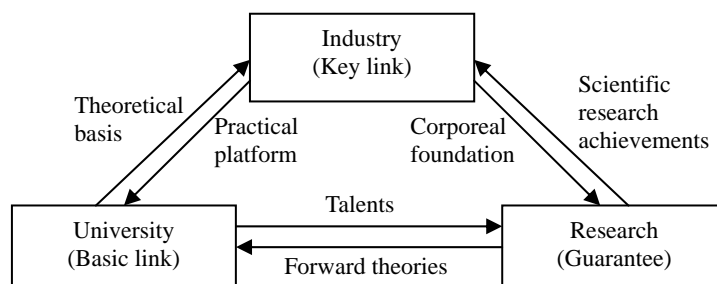


Figure 1 The Relationship among Industry, University and Research

### 3 The Ways and Methods of Industry-University-Research Teaching Mode of Real Right Law Course

#### 3.1 Diversified teaching means

About the teaching mode of real right law course, China learns from civil law countries' practice, and it is centered by teaching basic theories and pays attention to the cultivation of principle rules and academic thinking patterns. But the traditional teaching mode can not adapt to the demands of the society for talents, at the same meanwhile, to accord with the requirements of integration of industry, university and research, universities must reform the teaching means.

##### 3.1.1 Case teaching method

Case teaching method began in legal precedent method, which was founded by Christopher Langdell, dean of school of law of Harvard University in 1870s. It is a teaching activity that the students use their legal knowledge to analyze a case and decide how to deal with it. Real right law teaching usually has two kinds of forms: Firstly, the analysis form. The teacher introduces basic concepts and rules of real right law, then lists typical cases and analyzes them with the basic principles. Secondly, the discussion form. The teacher assigns the representative cases before the lecture, and encourages students to access information and exchange ideas to discuss the case, and explore real right law theory from the case.

Case teaching method can solve the tedious problem of traditional teaching mode, make the teachers' role from "lecturer" to "guide". It can improve students' ability to solve practical problems with real right law theory, and to arouse students' the spirit of inquiry and the spirit of innovation.

##### 3.1.2 Teaching method of simulated court

Teaching method of simulated court appeared in Britain in the 14th century. At first, it was used in the four famous lawyer college (Gray's Inn, Lincoln's Inn, The Inner Temple and The Middle Temple) of Britain. They used this method to investigate students' professional ability, and decided who can become the member of the British lawyer association. Teaching method of simulated court is that the teacher selects classic real right law cases, and at the premise of analyzing the cases, he let students perform the trail process by playing roles and debating.

Simulated court is that students reproduce the true court proceedings, "They regard themselves as parties or participants of the case, analyze the case from their own positions, and strive for the best results of the case for themselves. The debate issues may be fictional, but the simulated court is of good training significance."(Yin Chao, 2007) But, it should be noted that in the process of teaching, it can't be entirely confined to the "script", and makes role playing as "performance". Teachers can appropriately manufacture "emergency", and arouse students' reasoning ability, emergency ability and expression ability. Simulated court is a kind of heuristic teaching method, which places students in the case of the situation to analyze the case, and turn the theory into the practice ability.

##### 3.1.3 Clinical legal education

Clinical legal education began in the United States in the 1960s. In 2000, China introduced the mode under the Ford Foundation sponsored. China offers "legal clinic learning" course in more than 10 universities to improve students' professional skills, for example, People's University of China and Peking University. Medical school with the clinical medical treatment to cultivate doctor, and clinical legal education reference this pattern, make university alone or with other organizations to set up legal

clinics. In general, legal clinics are the legal education places with legal aid function, like Law Service Center. Clinical legal education enables students to contact the true real right case, talking face to face with the parties and under the guidance of teachers to deal with real right problems. This method makes the students to understand the real right law provisions and principles better, and improves the students' professional ability.

Clinical legal education makes real right law theory, real right law provisions associate with professional skills, and guides the students to think about the problem from the perspectives of legal practice. This method builds bridge between abstract theory and the practice for students, and cultivates students' legal analysis ability and legal skills. "To be more meaningfully study law, can't isolate from society, and just satisfied in legal theory or legal philosophy discussion." Madhava Menon said. (Madhava Menon, 2002)Clinical legal education breaks the barriers between teaching and practice in the traditional legal education, and builds the bridge between legal education and social reality.

**3.2 Exam system of real right law course**

The effect of exam system on teaching achievement should not be ignored. But at present, China's exam system of real right law course is out of date, and most universities only use the final papers as evaluation standard for students learning results. This approach not only cannot reflect the students' real level, but also deviate from the teaching goal of "industry, university and research integration". Therefore, establishing scientific exam system of real right law course is especially important.

First of all, change "disposable exam" to "penetrating examination", and abandon the disadvantages of traditional test. Teachers should increase the proportion of grades at ordinary time, and make a comprehensive and fair evaluation about students' theory master ability, practice ability, language ability, documents writing ability and the unity cooperation ability. Secondly, teachers should adopting diversified forms in examination. For example, increasing the oral exam link, teachers ask students to impromptu analyze the real right law cases, which is carefully chosen, to investigate strain capacity, legal skills and language ability of the students. Finally, we must pay attention to the National Judicial Examination's influence on the real right law teaching, avoid pursue reform and deviate from the practice, and do harm to students' employment. In short, the scientific exam system of real right law course can firm theoretical basis, stimulate innovation consciousness, cultivate talented person, and effectively make use of the advantages of Industry- University-Research teaching mode.

**3.3 Practical places in campus and training base outside**

Practice can improve people's working ability. The sampling survey of 20000 persons proves this point.

**Table 1 The Main Way to Obtain Working Skills**

Working Skills	Theoretical Study	Practice	Post Training	Other Ways
The Ability of Analyzing and Solving Problems	7.8%	75.6%	16.1%	0.5%
Operation Ability	3.7%	77.1%	18.4%	0.8%
Communication Ability	0.7%	85.2%	3.6%	10.5%
Independent Working Ability	3.6%	88.6%	6.8%	1.0%
Cooperation Ability	3.5%	88.6%	3.4%	4.5%

So practical teaching must be emphasized, and Industry-University-Research teaching mode must be used. In order to meet the requirements, using school resources is the most convenient measure. Therefore, it is imperative to construct practical places in campus, we can take the following measures: Firstly, the construction of simulated court. Let the students to play all kinds of litigation roles and participate in the lawsuit activity in simulated court. It's the comprehensive exercise of ability to using real right law. Secondly, set up legal aid organization in university, for example Law Service Center which is management by school. Law Service Center is not only a social welfare organization, but also a practice agency. It can help students to be familiar with the theory of real right law, use the real right law provisions more smoothly with the true real right case, and make the legal aid welfare activity combing with the teaching, scientific research, and social practice closely together. Legal aid organization not only makes students have the opportunity to practice, but also promotes the reform of teaching mode about real right law course. Thirdly, the construction of scientific research base in the university. With the scientific research base for the platform, making students participate in the research of latest

problems about real right law, cultivating students' innovation ability, and promoting the development of the theory of real right law. The campus practice base has the characteristics of systematic and diversity, makes the "Industry", "University", "Research" closely linked, improves the students' quality and enhances professional skills.

For comprehensive talent training, and making students have a solid theoretical foundation and strong practice ability, only on campus practice base is difficult to meet the requirements of Industry-University-Research teaching mode, it needs to expand outside school training base, and establish the cooperation relations among schools, courts, procuratorates and law firms. This method can be optimized to personnel training mode, and solve the problems such as dull teaching content, single teaching means, and weak links in practice. Outside school training base provides students with the real work environment, and in this environment it conducts post practice and implements the industry standard. It can improve students' comprehensive quality, help students to adapt to the needs of social development, and conform to the goal of Industry- University-Research teaching mode.

### **3.4 Information platform of Industry-University-Research**

The key of successful Industry-University-Research teaching mode is founding a connecting point among schools, scientific research units and legal practice units. Accessibility of information can help us seize the connection. So, establishing information platform of Industry- University-Research is especially important for us. It effectively removes obstacles of information exchange among subjects, realizes perfect combination among teaching, scientific research and employment, and makes for the optimization of resource allocation.

Information platform of Industry-University-Research is managed together by universities, scientific research institutions and legal practice units. Practice units should release information in the information center, which is about operation and frontier problems of real right law. Universities and scientific research units saw this news can timely communicate with the practice unit, and explore the methods to solve those problems. Schools can master the requests of employees enterprises and control the latest cases of real right disputes through the information platform, thus to adjust the teaching content and structure, and grasp the direction of scientific research. At the same time, universities and scientific research units can release the latest research results in time through the information center, improve transfer ratio of research achievement, and promote combing theory with practice about real right law.

### **3.5 The system of "double teacher"**

The system of "double teacher" is used first in the master's professional graduate education in China, for the purpose of training of high-quality practical talents. It is a teaching theory of combining theory with practice. The author considers that it can be applied in legal talents training mode universally. In terms of real right law course, a student is common guided by theory tutor and practice tutor. The theory tutors are the teachers of school, they teach principles of real right law, focus on the cultivation of the students' theory attainment, explore frontier problems of real right law, and guide students to do scientific research activities. Practice work unit personnel as practice tutors, their main task is to guide the students to improve their professional quality, and cultivate the students' ability about analysis of case details and application of law, so as to make the students adapt to the future work as soon as possible.

The system of double teacher comprehensively shares campus and social resources, absorbs fresh blood of outside school to join the tutor team, set theory and practice training in a body, and highlights advantages of tutor group. The traditional close-end teaching model is transcended by this diverse training mode. Real right law course is guided by theory tutor and practice tutor, and they cooperate with each other to help students to cognize the theory deeply, enhance their professional quality, inspire their potential ability, and shorten the process of student success. The system of "double teacher" makes students apply frontier theoretical results to analysis of real cases effectively, so as to realize the combination of Industry- University-Research. This method can better adapt to society for the high level talents' demands.

## **4 Significance of Industry-University-Research Teaching Mode**

### **4.1 Improving the students' comprehensive quality**

The Industry-University-Research teaching mode breaks through disadvantage of the traditional closed cultivation mode of real right law course, and establishes relationship among universities, scientific research units and society. This model creates favorable environment for talent growth. Its

main characteristic is to use personnel training advantage of schools, practice units and scientific research units. The school education environment which mainly imparts knowledge is combined with production environment which is gain practical experience in the process of cultivation of students. Therefore, Industry-University-Research teaching mode of real right law course can improve students' comprehensive quality and professional skills. It takes the social demand as a guide, makes full use of the diversified teaching resources and teaching environment, and makes the lectures, research and practice together. It can not only make students' cognition of the basic theory of real right law, but also tap their potential, enhance the practice ability, and shaping a high level of comprehensive talent.

#### **4.2 Raising the level of teaching and scientific research**

Industry-University-Research teaching mode brings a closer relationship among the schools, scientific research units and practice units. Teachers can extract teaching materials from the latest real cases of real right law, adjust teaching structure, update teaching contents, and make teaching activities combine with practice. Discussing legal application problems in class can stimulate the students' practice ability and innovation ability. At the same time, scientific research units can also find new application problems of real right law from case agents and trials, force scientific research items, conducts research exploration work, and form research results of real right law which have application value.

#### **4.3 Promoting the transformation of scientific research achievements to practical application**

Real right law is an applied course, but restricted by the traditional teaching mode, a lot of advanced theoretical research results have been idle. Industry-University-Research teaching mode makes information circulating, and provides a platform for transformation from the theory to the practice. Practice units can quickly get the latest theoretical research data of real right law through cooperating with schools, find problems in the case processing and perfect the analysis ideas by taking advantage of the superiority in talented personnel of school, and to ensure that the results are fairness and justice. The application of Industry- University-Research teaching mode of real right law course is beneficial to academic research joint track with practical operation, realizing complementary advantages of university and practice unit, and promoting scientific research achievements transform to practice.

## **5 Conclusion**

The application of Industry-University-Research teaching mode of real right law course can improve students' comprehensive quality, promote theoretical innovation of real right law, and improve transformation efficiency research achievements. And a new mechanism of cooperation will be established among universities, scientific research units and practice units. Industry-University-Research teaching mode is a continuous developing issue, so we need to take the law of social development and the interests of all parties into consideration, continuously adjust and perfect the cooperation mechanism. Then put the achievement into the practice of real right law teaching to optimize the teaching effect.

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# Research on the Brand Communication Media and Channels of Mobile Internet Age

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**Abstract:** A research mainly focused on the development of media in the Mobile Internet Age. The research discusses the evolution of the traditional media, application of mobile Internet media and the development prospect. We consider the structural changes happen in the brand communication channels in the certain age. We make comparisons with characters of brand communication media and channels considering the rapid development of Internet technology in longitudinal and latitudinal way. Suggestions about the innovations of the brand communication channels are drawn to be a reference for the operators to promote the management level of their brand communication.

**Key words:** Mobile Internet; Brand Communication; Media; Channel

## 1 Introduction

Mobile Internet defines as a network that users could access to the Internet with their cell phones, PDAs or some other choices of mobile terminals. Users can enjoy in the public Internet Services at any moment. On the coming of the Mobile Internet Age, the transmission techniques are comprehensively developed and such a kind of progress influences the conditions of the original transmission ecology. In the applications of the novel techniques, media competition and convergence springing up, diversifies the media Channels.

We are in an age that Virtual reality contacts and exchanges are in unprecedented prosperity. In this era, facing to the trend and small demand, brand communication should be in further research, ignorance in none of these aspects, is it possible to grasp the balance of the brand communication stance. The current brand spread is already entered the mobile Internet communication environment, and there is little experience on dealing with problems in the era, for such phenomenon has never occurs before. Brand spread needs the communication to be more diversified, more media-oriented, since these factors result in great changes of brand communication demanding characteristics: the brand communication process of interactivity and humanized factors mobility, to promote the brand communication. The research made comparisons of the various media characters and analyzed the respective advantages of applications with such media in brand communications, and then suggestion of some methods and orientations to the coming development in brand communications.

## 2 Media Development in the Mobile Internet Age

With the rapid co-development of Digital and Network technology, the original transmission ecology has been influenced tremendously by the booming in mobile Internet. As of December 2009, the approximate number of netizens in China is 484 million, according to statistics. The penetration rate of Internet increases as a rate of 28.9%.

The netizens population with cell phones increases by 120 million per year, reaching 233 million. Smart phones and mobile terminals dominate the media equipment markets. Users who surf on Internet using cell phones have become new growth point of Internet users in China. Under certain circumstance, traditional public media and mobile Internet media present the tendency of convergence. According to the Report of development in China Digital publishing industry 2007-2008 by China Institute of Publishing Science, 37 newspaper groups, more than 300 newspaper presses all around the nation produce digital newspapers on the Internet with the digital newspaper technology. The whole newspaper industry in China has produced about 1500 kinds of digital newspapers for cell phones, covering divergent fields, as of the end of 2008.

Large media groups own their websites. Taking Xinhua News Press as an example, they proposed to expand their business to the multimedia news platforms for a bigger audience population in *Working Scheme for 2008-2015 of Xinhua Press*. They established Xinhua Network, Xinhua Mobile News, Mobile TV, ODTV (Outdoor Television) and IPTV and so forth, the transmission of those content in which are mostly rely on the Xinhua Network and Mobile News platforms. Also we know that the broadcast and television media groups are more and more tend to focus their attentions on the trends of

multiple transmissions of their media content. A typical example is CCTV, which spread their business to CNTV, Mobile TV, IPTV, and some other mobile digital TV programs. During the Olympic Games 2008 in Beijing, the CNTV platform achieve the coverage of 200 million netizens, programs broadcasting to the mobile users 510 billion times, on 80 thousand screens, with 50 thousand buses, in 30 cities.

In the future, with the universal 3G business carried out, Mobile Internet will be applied to every possible aspect of the social industry and daily life. The users and business scale will achieve explosive growth in such condition. Morgan Stanley published their research in December, 2009. It shows that the speed of mobile Internet development has surpassed the speed that based on desktop access. Within 5 years, users with mobile terminals will become the majority of the Internet users. 3G Technology, SNS, Online Video, IP telephone and mobile equipment are five major supports that can represent the development of the mobile Internet. The future of mobile Internet development will rely on the key factors such as users centered, with voices, data and multimedia services on the open networks. Consumers will be active in the interactions on the mobile Internet more frequently with more hours spent on at the same time. Such a tendency will lead to that the mobile Internet centered media technology is gradually clear.

From all above, the mobile Internet media will be the main stream in the transmission markets as the bellwether compete with the other media technology.

### 3 Selections of Brand Communication Media in Mobile Internet Age

The convergence that occurs among media in the Mobile Internet Age enables the consumers to be active in their preference of access to the Internet. Choices of terminals are the results decided with a combination of physical characters of the media, practical operation preference and mode of thoughts by the users. Commonly, three types of media will cater to most appetites of consumers. News preferred people are tend to real-time information and portable devices. Then the cell phones and netbooks will be their first choice, while people at home will enjoy in high definition TV programs with Digital TV terminals. Digital newspapers will satisfy the Deep Thinking requirement that comes from the special group of people. Cell phones and laptops will more consider the individual demands from the different users.

In the mobile Internet based age, broadcast, TV, newspapers, magazines and even outdoor multimedia will achieve their transformation and convergence with the new styles of media, accomplishing their multiple media business. Compared with the traditional media, media on mobile Internet have gained higher speed to eliminate time delay in real-time transmissions, and have changed the size of the equipment and ways of interactions into active methods. Therefore, differentiations among those media, like broadcast, TV, Newspapers, will be mainly concentrated on the contents they received and preference or trust in the media style that coming from the willingness of users. (See in Table 1)

**Table 1 Characters of the Contents from Different Media**

characters	TV	Broadcast	Newspaper	Magazine	Outdoor	Network	Cell phones
Authoritative	√		√	√		reprinted	reprinted
Entertainment	√					√	√
Notification		√			√		
Size					√		√

As is mentioned above, the technology enables the media with real-time transmissions. That is to say, authority of the media but immediacy of information now in the Mobile Internet Age is the primary problem. People can only accept limited information every day. It's enormous cost for common people to identify information from different news sources, thus the selection standards are important to the consumers. As to the authority of the media, it is more likely to have the traditional opinion in minds; that is, like the newspaper and TV news with convincible reality in news reports, the contents from four major news media on the new platform in this age tend to be leader power of the opinions. Consequently, when setting up brand communication to the public, we should pay more attentions to such media types

to establish brand image with advantages in guidance of brand incipient communications.

To those entertainment contents, we recommend to choose video media. Video can compound sounds, pictures, words with useful information to strengthen their brand with creative carrying capacity, which will satisfy those pursues in the brand communication. What's more, Video requires only images in minds, accepted by most of the perceptive of the consumers. That makes it entertainment. As to the brand communication, they are searching for creative and perceptual characters, which are available mainly on the video media. Moreover, some other media brands with little fame could make use of the creative carrying capacity and comprehensive acceptance of videos to root their brand communication among the consumers in the incipient period.

To those notified content, outdoor media or broadcast will suit for the transmission better. In the Mobile Internet Age, outdoor media will thrive for its more reliable technology. Outdoor media in the Mobile Internet Age act as the signs of the metropolitans highlight the prosperity of the cities. Except for the billboards and signs at the bus stops, mobile Internet raises the popularity of mobile TV screens. As is to the limitation of the outdoor media, broadcast appears as a supplement of other media types with its audio information. Under certain circumstance, audiences have no other choices but the audio type, with a contact named "instantaneous style". Because of the "tough" feature people get information from audio and outdoor media, those audiences usually pay little attentions on this. The outdoor media and broadcast therefore match for the use of simple advertising messages, like something outside the cars or the buses, which means people can hardly peruse from those words. We classified such media as types for low-level concerned products, and usually for the purpose of notifications or promotion in sales.

Brand communication of high-level concerned products needs newspapers or other network media as their advertising platforms. Consumers will always search for these messages and take times in realizing those products. Thus, when coming to such brand communication, words and graphs for detail expressions are necessary to promote the recognition to the brand and products from the consumers. Usually, we choose to transfer abundant information on the media platforms like the newspapers or magazines. We try to attract consumers for these messages but push them to the consumers.

## **4 Brand Communication Channels in Mobile Internet Age**

The arrival of mobile Internet age brings the enormous changes of communication pattern, and channels of communication present diversified trend. Commercial value and influence of the channels is no less than the content, and thus the development of channels turns to be the focus for mobile operators to compete.

### **4.1 Innovative application of traditional and new channels**

The mobile Internet has had a great impact on traditional communication channels, the arrival rate and the amount of advertisements of traditional channels such as newspapers, radio and television are reducing gradually. The mutual integration of mobile Internet and traditional media changes the total portfolio of medium. Developed mobile Internet media will serve as the core communication platform and other traditional media as a supporting role in the communication system. The innovative application of traditional and new channels mainly reflects in the following aspects.

#### **(1) The innovative application of print media**

With the development of mobile Internet, print media is facing many challenges, including the growth of online media, the rise of electronic media, the competition among peers, the change of audience reading habits, the impact of the economic boom and the rapid technological innovation. Aiming at these problems, in order to broaden communication channels and facilitate communication, print media should get innovative applications. First, innovation is the application of new technologies. With two-dimensional code technology, the two-dimensional code on the newspapers / magazines is scanned with a phone, and then coupons, news clips, questionnaires and pictures will be automatically downloaded, thus paper resources are turned into mobile information resources. Print media is no longer just printed. Based on the application of this technology, the interaction between print media and audience will greatly enhanced. Meanwhile, the mobile Internet should strengthen the content and integrate resources. Integrate internal and external resources, combine with network and make use of mobile technology to expand the application scope of print media and enhance the core value.

#### **(2) The innovative application of television / radio media**

The innovative application of television and radio media includes two aspects. For the hard advertisement aspect, determine the type of audience through a terminal monitoring, and then make an immediate feedback and put in appropriate hard advertisements. This use provides put more mobility for

the put-in of TV / radio and reduce the errors in the prediction period. For example, put the right ad through the high-frequency vocabulary by web search and then further filter information according to the results of the survey feedback, which makes communication more accurate, more extensive and more successful. In software aspect, strengthen soft-depth cooperation with the related programs and carry out soft implant, such as game vote and finale vote by mobile Internet to strengthen the interaction of the program.

(3) The innovative application of the Internet media

Internet information can be automatically downloaded to users' mobile phones through their settings, including life information like train schedules and online video on the computer which hasn't been finished by the audience. The download information will include advertisements, which break Internet advertising away from the computer and expand the coverage. At the same time, the Internet will combine with television, radio, newspapers and other communication channels, integrating new channels, such as network television, and electronic magazines. In the Mobile Internet Age, this integration will be more frequent, the innovative application of network media will get a wider range, and communication channels will be more diverse.

(4) The innovative application of outdoor media

Monitor mobile phone information covered by outdoor LED with terminal technologies in order to analyze the population category and automatically put the related business advertising for this crowd of population. Connect all LEDs in the entire city through technology and automatically identify the appropriate points to put. Then the outdoor media will break the regional limitations and advertising coverage is broader and more accurate.

#### **4.2 The integration of mobile operators' own brand communication channels**

Rapid market expansion of the mobile operators must rely on a broad and efficient system of marketing channels, along with the increased market competition in the mobile communication business and the enrichment of mobile communication services, construction and management of marketing channel system for mobile operators are developing to adapt to market changes, presenting changing trends from extensive and dispersed one into a uniform, standard, fine planning, close coordination and more focused management.

At present, the channel system of mobile operator includes the following two types: master channels mean the core channels which operators directly control and directly get involved from property rights perspective, including self-built business hall channel, self-service stores, major customers services, customer service hotline and operator websites. Social distribution channels refer to the sales-type channels in addition to operator self-built channels expanded with the use of social resources from the level of cooperation, which is an important complement of the operator's core channels. That includes the business hall of the social agents, cooperation brand stores, franchised stores, authorized sale points, retail points directly supplying standard cards and so on.

During the Mobile Internet Age there are still some prominent defects in the channel system of the mobile operators, such as coverage is too concentrated, channel means is too single, the existing channels isn't able to reflect the value of customer service better, and more market user information can't be obtained. With the development of mobile Internet, there will be more brand business to be launched, the existing channels is obviously not suitable or even will restrict the flow of 3G products and development of 3G services. Existing channels of the mobile operators rely only on the master channel and cannot ensure a dominant position in the competition. As a result, mobile operators must integrate its own channels and supplement it with the cooperation of social channels to strengthen marketing service function of the channels and enhance the comprehensive level of service. The integration of mobile channels is recommended to start from the following aspects.

Firstly, transform and upgrade mobile operators' own channels. Transform and upgrade of its own channels will help carry out the implementation of the overall marketing strategy downward, help enhance the businesses brand image, and help serve and retain the final user and help to new business timely.

Secondly, enhance the proportion of social channels and strengthen cooperation. The marketing of t3G products in the Mobile Internet Age make the market share become the goal for operators to compete for. At present, the first batch of TD depth customized mobile phones of China Mobile is in the product maturity period, and more than 2,000 Mobile business halls will sell it, which is associated over 1200 social channels.

Thirdly, introduce into e-commerce channels. At present, some operators have begun to try to

introduce into this new e-commerce sales model. China Mobile launched the first 3G network card online sales on Dangdang.com. Beijing Telecom has also announced cooperation with Joyo, Dangdang and Taobao for the sale of 3G network cards on these sites.

## 5 Conclusion

From the above analysis, we can conclude that a huge change has taken place in the brand communication media and channels with the rapid development of Internet technology. Targeted optimization and integration of media and channels of brand communication will play a significant role in the future development of China's mobile operators.

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## Research on Industry-University-Research Institute Strategic Alliances (IUR) Benefit-sharing Mechanisms\*

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**Abstract:** The research of Industry-University-Research institute strategic alliances benefit-sharing mechanisms is in purpose of achieving the tripartite interests of enterprises, universities and research institutions. It can be confirmed the benefit sharing is an important goal for research strategic alliances. Benefit-sharing mechanism is more important of IUR. As the IUR parties are obtaining their respective interests, we must deal with several aspects of IUR including capitals distribution, approaches allocation, trust mechanism and so on. The final target is to establish a reasonable benefit-sharing mechanisms so that to stabilize the strategic alliances. This research will use and demonstrate method in strategic alliances to the distribution of benefits, and it aims to help each party to explore a common way for profit sharing in the end.

**Key words:** Industry-University-Research (IUR); Strategic Alliances; Benefit-sharing Mechanisms; Qualitative analysis

### 1 Introduction

With the rapid development of the information age, Chinese economy is growing to a deeper level in a wider area. This new age has provided new opportunities for Chinese economic development; however, it also faces severe challenges. At present, most enterprises' own technological innovation capability is not strong; it has a considerable gap with the developed countries. Also, there are low level products, weak competitiveness, and lack of independent intellectual property rights. In order to adapt the new technology age, IUR should use the advantages of the research cooperation, joint development, and the independent intellectual property rights to improve the core competitiveness of enterprises.

The traditional theory of strategic alliances consists of two or more enterprises achieve the strategic objectives of resource sharing risk or cost-sharing, complementary advantages and expanding markets. Each of them has equity to participate or make other agreement to form a loose organization of cooperation and competition. This is a narrow understanding of the strategic alliance, while generally speaking; strategic alliances members are also including universities, research institutions and government departments (Adams, 2002). The IUR strategic alliance cooperate with forms of organization which is based on knowledge - technology - the exchange of information as the main way of new combination mode. It will become an effective way of solving technology and economic integration so that it will guide economic development as well. IUR strategic alliances cooperates both universities and research institutes in order to the further extension of the industrialization and commercialization process, and the fundamental character. So far, the need for academia research on the strategic alliance in research development and research strategic alliances, feasibility, and their development prospects; the problems in the economies in transition IUR strategic alliances; proposed by IUR strategic alliance system. Other suggestions such as mechanisms, concepts, patterns and other aspects of the proposals and ideas are waiting to be proposed. IUR strategic alliance benefit-sharing mechanism are rare, therefore there is few information, so I would like to conduct further analysis of this issue, and thus to contribute to research and development of IUR strategic alliance benefit-sharing mechanisms.

### 2 The Problems of IUR Strategic Alliances Benefit-Sharing Mechanisms

The benefit of IUR alliance is depending on a mutual alliance and coordination of enterprises, universities and research institutes, as a whole created new income. The starting point of the benefit-sharing is solution to the interests of fair and reasonable distribution issues, including to determine who is the main interests of the creation of the coalition parties contribute to the growth in interest size, in order to achieve a common goal for sharing the benefits. Under the market economy

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conditions, the distribution of benefits is the driving force to promote research alliances and maintain healthy functioning of IUR ties.

**Table 1 Rank of IUR Cooperative Level in 2006**

Country	Cooperative level	Rank
America	5.6	1
Switzerland	5.6	2
Sweden	5.6	3
Japan	4.9	14
China	4.1	25

From Table 1 we can see America, Switzerland, and Sweden are the top 3 in IUR cooperative level. China only ranks 25. The IUR development in China is not as strong as others. In order to push the development of Chinese IUR, we should study how to establish benefit-sharing mechanisms effectively, and begin with the distribution of benefit issues.

### **2.1 Unreasonable capital risk**

Universities and research institutions do not have the direct financial capacity and strength of self-transformation. In IUR, the enterprises as the mainstay in most cases offer the funds and universities or research institution provide the talents and equipments because of technical support function. Thanks to such differences, universities and research institutes are usually the safe parties in capital risk aspect. However, enterprises almost have to bear the risk of financing difficulties, and the uncertain investment returns brought by the cooperative process. When the enterprises are facing enormous pressure to bear such a high risk will inevitably prohibitive for many high-tech achievements, or they are only willing to bear part of the risk in the cooperation, and hope to pass on some of the risk to other risks investors. The unreasonable capital risk will not only dampen the enthusiasm of the cooperative, but also will lead to financial bottlenecks in the process of cooperation.

### **2.2 Unfair benefits distribution mechanism**

Under normal circumstances, enterprise, university, research institution cooperation will be the distribution of benefits that have their own expectations, but in order to ensure the smooth cooperation, parties should to make an agreement on the details of the distribution about benefits. However, due to the three partners' differences for industries, systems, fields and point of views, it is often difficult to coordinate and it is easy to result in contradictions. The difficulties are: Firstly, scientific research transfer pricing is difficult to confirm. Various stakeholders have different ways to determine the price, enterprises are mainly based on the potential benefits, and academic institutions are mainly based on technical research and development costs price. Secondly, there exists the outcome of the ownership on intellectual property issues. Conflict of interest demands of all parties, organizations and poor cooperation in a short time, low degree of cooperation and exchange are important factors that lead to disputes. Thirdly, the distribution of benefits problem. Build entities, universities and research institutes were put into a certain proportion of funds, manpower or equipment to work together to build a model of the joint R & D base. If the IUR lack of the unified standard, the outcome will get mess in the end.

### **2.3 Inadequate trust mechanisms**

Members of the research in the strategic alliance, especially those of enterprises, their reputation and spirit of cooperation are the key factors to affect the IUR formed and well-run. They are also addressed as a key issue of benefit-sharing mechanisms. The spirit of cooperation is part of corporate culture, but most of the enterprises have not been a good corporate culture. Also, there is more lack of internal cooperation than external. If only enterprises just concern tangible profits simply, so that the purpose of IUR will not to achieve win-win situation, but to use more economical way to learn the key technology of others. This collaborative environment will be a serious impediment to the development of domestic research cooperation. When each party in IUR chooses the partners, they will show some preferences, norms and standards, and each other has a strong dependence. When a party in the research strategic alliance formed on certain types of partners, the understanding may be to strengthen and enlarge, concrete is divided into two extremes: the unlimited confidence and infinite trust. Either of them is not good for parties to get the right information.

### **2.4 The tendency of opportunism behavior**

The so-called opportunistic behavior is not only the pursuit of personal interests to maximize the economic man in the transaction process, and through improper means to seek their own interests. The new institutional economics emphasizes human behavior has a tendency to opportunism. Cooperative

performance for all stakeholders shows a resourceful, opportunistic to reap greater benefits for their own behavioral tendencies. In cooperation, each party knows others less just surface information, thus one can not use the others' disadvantages to do the opportunistic behavior. In this field, it is hard to prove a breach of contract that resulting in opportunistic behavior is difficult to be confirmed in court. Hurt by opportunists often reluctant to resort to the judicial process, the way of sanctions against opportunistic behavior is more limited.

### **3 The Analysis of Problems to Benefits Distribution of the IUR Strategic Alliance**

#### **3.1 Imperfect agreement of IUR alliance benefits distribution**

Because of the limited rationality of stakeholder cooperation that may arise in opportunistic behavior can not in the cooperation to be fully anticipated. When parties signed a research cooperation contract without fully information about each other, thus clear the rights and obligations of the contract are often incomplete. So, if one party begins with opportunistic behavior, such as capital withdrawing, others have nothing to against In addition, parties have less alliance awareness, lack of efficient technology management system and the spirit of cooperation, the concept of risk prevention. It is extremely unfavorable to meet the IUR risks and challenges in day-to-day cooperation. Thirdly, research cooperation projects of IUR on the property and post-distribution of the proceeds failed to clear in the contract, resulting in cooperation in the late disruption difficult, thus affecting the entire development, strategic alliances initial and final overall.

#### **3.2 Lack of laws and regulations to guide**

At present, the legislation still no specific legislation for the research, the existing legal provisions and more dispersed in the technological innovation legislation, despite the technological innovation legislation has formed a certain system, but there are still many problems. Firstly, legislation does not systematic in technological innovation. There is no special 'Technology Innovation Act'. At the same time, technological innovation related to the field of urgent legal regulation has no legal basis, such as venture capital, basic research, and science and technology investment. Secondly, the existing technology law operability is not strong to implement, inspect and supervise. Chinese legislation is basically the product of planned economy, which is too principled, obscure and general so that lack of legally restraint. Again, law enforcement is not perfect in recently. Many of Chinese judicial and law enforcement officers know little about the scientific and technological knowledge or technological innovation, they are lack of specialized technology legal talents. These aspects will directly affect the IUR does efficient cooperation.

#### **3.3 Lack of intermediary services**

Intermediary service system refers to the institutions of scientific and technological achievements that play a role as a bridge between supply and demand side in scientific and technological achievements. Intermediary and professional services firms are important parts in technological innovation and industrial development. In recent years, Chinese scientific and technological achievements intermediary services from scratch to a certain development still have some problems, such as large multi-functional single institution is not perfect, information services in a timely manner or lack of accuracy. There are few special intermediary service organizations to offer the related service so that the information exchange platform is hard to build. Because of the information can not be offered integrity for each party, it often leads to different views in post-production of research. At last, the result will delay or hinder the cooperation project.

#### **3.4 The asymmetry information**

Segmentation of the management system, universities, research institutions and enterprises still has barriers of cooperation - a crisis of confidence. At present, cooperation between universities, research institutions and enterprises are mostly the way of project cooperation which have short-term, temporary features. These features influence the flow and exchange on parties mutual and the long-term, stable and institutionalized community of interests' establishment. Yet to truly get rid of the institutional barriers between universities, research institutions and enterprises, cooperation is still stuck at a relatively low level, real research strategic alliance to establish still have time. Thanks to the barriers, the mutual trust between the members of the research strategic alliance is often difficult to form in the conditions of lack of an effective signal to indicate information screening so that avoid moral hazard considerations. Ideas differences, differences in value orientation, risk preference differences or behavioral style differences may lead to a series of factors that affect the real cooperation then become "trust threshold".



## 4 Conclusions

Benefit-sharing mechanisms of IUR strategy alliance is based on enterprises, universities and research institutions as the core, it has integrated research elements and resources from each parties of the strategic alliance, and used modern means of science and technology, unified and coordinated to distribute the benefits orderly. In order to satisfy each participate parties' benefits and reduce the intensification of contradictions due to the uneven distribution of benefits. Rationalization of benefit-sharing mechanism is better to resolve the parties' contradictions, which makes all parties in the interests of the drive, to achieve the fundamental purpose of the research cooperation to "win-win".

### 4.1 Strengthen risk awareness and alliances awareness

Science and technology systems should strengthen universities, research institution's alliances consciousness. Around the needs of the market economy, in order to achieve scientific and technological resources to optimize the allocation, and get the research institutions reenter the market. Government uses market allocation of resources to build the related operating mechanism and organizational models, which comply with the law of market economy operation. For striving to take up their place in the high-tech fields, universities and research institutions should take the initiative to strengthen contacts and cooperation with enterprises, and compound their respective scientific and technological advantages, personnel, academic advantage, industrial advantage to overall advantage of pro-competitive, when based on technology transfer, joint research, seminars, personnel exchanges, technology services, etc.

### 4.2 Benefits and risks sharing mechanism

"Joint development, complementary advantages, benefit-sharing, risk sharing" is the general principles of the research the distribution of benefits. The long cycle of major industrial and technological innovation activities require the research parties have steady cooperation credit, as well as get what they want the protection of the interests. At this time, contract should be applied. Each parties establishes the benefits and risks of long-term cooperation mechanism of IUR on a voluntary basis, Intellectual property as a central link to solve the mechanism of distribution of benefits issues, around all aspects of the creation, application and protection of intellectual property rights, define the responsibilities, the right and the benefits. The key for IUR is to form a "community of interests" to be self-running. At this stage, we should gradually establish the responsibility system by the research risks in strategic alliances, to achieve a hierarchical decomposition of the risk liability in a phased manner. For example, Japanese government set an intermediary service called high-technology market, which is promoting the research achievements shift to enterprise and letting the achievements industrialization. This action cuts the risk and makes the cooperation more stable.

### 4.3 Improve the trust system

Effective communication is an important means of building trust between alliance members; we should establish a formal mechanism for information exchange in order to share internal knowledge and external market information. Also, pay attention to the informal exchange and communication between the alliance officers. Interpersonal communication between the alliance to improve the efficiency of cooperation, and resolve cultural differences and barriers between the different members so that the principles and methods of doing things can be acceptable to all parties, and to lay a cultural foundation for the establishment of mutual trust and a good atmosphere to create. Finally, strengthening the information networks establishment to interactive platform for the coalition parties to provide information, promote the exchange of information to universities, research institutions and enterprises.

### 4.4 Stressed that the government functions

To strengthen the IUR strategy alliance, government should shift its focus to the macro-control to create conditions and environment for the strategic alliances. Formulating of laws and regulations to provide policy guidance and services, and research to develop and organize the implementation of protection of intellectual property policy and industrial policy. Such as the specialized agencies or organizations' function are coordinate the research cooperation process. Both of them are aiming at developing and improving the laws and regulations of the policy. What's more, the government makes strong strategic alliances with production-related theoretical research and policy analysis to develop strategic alliances and research supporting fiscal, financial, risk and investment, and research market laws and management approach encourage policy measures, particularly intellectual property laws and regulations. The NSF of America is a good example of China to study. It is not only stress the local government's guide and coordinate function, but also provides the key topics to universities.

In addition, this essay has further clarified and strengthened the important role of strategic alliances in IUR benefit-sharing mechanisms, and raised objective and systematic research strategic alliance

benefit-sharing mechanism to provide a good performance guarantee for IUR strategy alliance. But this paper has larger proportion of qualitative analysis, quantitative analysis has been lacking through my writing process. At the same time, due to restrictions on the level of professional academic research on certain issues is not enough in-depth and comprehensive, I am looking forward to discuss further with other academic peers in the future.

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## Study on the Strategic Model of Oversea Mergers and Acquisitions in the Post-Crisis Era: A Perspective from the Core Competence

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**Abstract:** During the *post-crisis* era, Chinese enterprises participate in overseas merges actively. For the potential risks in the processes of the overseas mergers and acquisitions, it is a crucial problem to promote the mergers' abilities for the domestic enterprises. Based on the common principle of core competence theory, this paper illustrates that building, extending and refreshing core competence are always the direction in the course of overseas mergers, and proposed a concept model for the overseas mergers and acquisitions strategy in the background of *post-crisis* era.

**Key words:** Model; Mergers and Acquisitions; Core competence; The post-crisis era

### 1 Introduction

The post-crisis era refers to a more stable state after the crisis easing. This steady state is a relative term since the fundamental cause of the crisis has still been existing. There are still many uncertainties in the world economy and it is a coexisting state of a detente with the crisis. Affected by the subprime crisis, financial tsunami happened, national consumer confidence dropped and the market expectation became sluggish all over the world.

The number of the global mergers and acquisitions (M&A) activities has been drastically reduced since 2008 under financial crisis, which runs directly counter to China. Ministry of Commerce of the People's Republic of China encouraged internal qualified companies to implement vigorously "going out" strategy in 2010 and actively carried out foreign investment and multinational management. The government would reform deeply the foreign investment management system, promote foreign investment facilitation and support internal companies to go abroad to participate in international economic cooperation and competition<sup>[1]</sup>.

Counter-cyclical cross-border mergers and acquisitions is in accordance with China's "going out" strategy, which is the important attempt to cultivate multinational corporations commensurate with the economic power and maintain industrial security<sup>[2]</sup>. Chinese enterprises have been carried out lots of cross-border mergers and acquisitions since 2008 and the following table (Table 1) is the notable example in May 2011.

### 2 Overseas M&A Risk Analysis in the Post-crisis Era

The number of M&A is very large<sup>[3]</sup>. But the statistics analyzed by McKinsey & Company show that about 67 percent of China's overseas acquisitions is unsuccessful over the past two decades. Then is it an opportunity or risk for the development of Chinese enterprises through the strategy of overseas mergers and acquisitions during post-crisis era? In general, the causes of the failure of cross-border M&A have four categories: (1) the country's political and policy barriers where the target company exists; (2) the inappropriate timing of M&A; (3) the lack of experience of cross-border M&A; (4) the unsuccessful integration of M&A.

The chief factor to guard against trade protectionism of the host country of the target company should be noticed by Chinese enterprises in the process of overseas M&A. But it is more important to increase their ability to prevent and reduce the rate of failure of M&A caused by the latter three reasons<sup>[4]</sup>. How to realize the success of M&A is the important problem and maybe the means that the enterprises make it round the fostering and enhancing of core competence during the process of M&A is the good choice.

### 3 Model of Overseas M&A Strategy Driven by the Core Competence

Overseas mergers and acquisitions is the strategic behavior to achieve business development for many enterprises, and it also a good method to get the international competitive power. To get the success of M&A, enterprises should do overseas M&A based on achieving and enhancing the core

competence. According to the process of cultivating the core competence: the identification of the core competence, the attainment, the shift and the integration of the core elements, the enhancement of the core competence, we could divide the process of M&A into five stages: the preparing period, the negotiating period, the trading period, the integrating period and the consolidating period. As the following figure shows (Figure 1). It can be seen that every stage of M&A are in accordance with every stage of attaining and upgrading of the core competence. That is, the whole mergers and acquisitions' process should go along around the core competence.

**Table 1 the Transaction Size of Various Industries in China M&A Market in May 2011**

Industry	Number	Number disclosed	M&A Amount disclosed (US \$M)	Average M&A Amount (US \$M)
Energy and Mining	14	11	3863.33	351.21
Chain Operations	3	3	1176.69	392.23
Real Estate	11	9	1070.06	118.9
Financial	8	8	308.67	38.58
Food and Beverage	1	1	159.53	159.53
Manufacturing	24	23	148.42	6.45
Chemistry Industry	7	6	79.64	13.27
Agriculture, Forestry, Animal husbandry, Fishery	5	5	78.76	15.75
Building materials	5	4	72.19	18.05
IT	15	14	69.27	4.95
Internet	5	2	43.66	21.83
Health	9	9	32.04	3.56
Transport	1	1	29.32	29.32
Culture and Media	1	1	10.55	10.55
Car	2	2	5.91	2.96
Telecommunication	1	1	1.03	1.03
Tourism	1	0	0	0
Synthesis	16	12	36.43	3.04

(Data from www.ChinaVenture.com.cn)

### 3.1 M&A Preparing Period

Cross-border M&A is a complex process, which involves cost assessment, valuation, financing, contracting, implementation of the transaction, integration and other aspects, many enterprises without internal professionals should hire some experts from outside to help the M&A companies analyze and operate the whole process to evade risk. After analyzing the external environment and internal conditions, M&A companies should investigate and collect the target companies' information to carry out the valuation, so that provide a scientific basis for financial feasibility analysis, M&A risk controlling and determining payment cost. The valuation is not only for the target company, but also for M&A company itself and composite company<sup>[5-6]</sup>. Estimating the range of payment cost and the value added caused by M&A are also necessary.

### 3.2 M&A negotiating and trading period

Enterprises must carefully adjust their capital structure according to the result of analyzing and negotiating of target companies, choose a suitable means of financing to get funds M&A need, and then determine the payment range and method. As a result, M&A trading is put into action. M&A must hire some relevant legal advisers to ensure M&A transaction effectively.

### 3.3 M&A integrating period

M&A completion among enterprises can only show it has finished property transactions in the legal sense, which doesn't mean various elements of resources have been reconfigured. The objective of

M&A is not only obtaining the property rights of the target companies but also acquiring, building, strengthening and expanding the core competence. The integration of M&A is the key successful factor for the composite company. Implementation of an integrated strategy must continuously adjust according to the specific circumstance of the two sides. How to integrate is also requested to design in prior planning and arrangements of M&A.



Figure 1 Model of M&A Strategy Driven by the Core Competence

In general, M&A integration must be carried out from six aspects: strategic integration, the integration of skills and knowledge, integration of human resources, organizational integration, systems integration and cultural integration.

(1) Strategic integration. Strategic integration after M&A is the adjustment of the enterprise's developing direction. It may decide the future of corporate positioning. The company's development strategy after M&A should be made according to the direction of corporate development and the environment in the future. The strategic integration includes of the integration of the strategic decision-making body and the integration of the strategic objectives, the strategic measures, the strategic steps of each subsystem. It requests the target company should enter the strategic frame of M&A company so that the asset use and business extension of the target company could obey to the overall strategy objective and other correlated arrangement of M&A company.

(2) Integration of skills and knowledge. Core competence is the cluster of skills or knowledge, there are three types of skills transfer in M&A: the transfer of general management skills, the sharing of operational resources and the transfer of functional skills.

(3) Integration of human resources. First of all, M&A company should maintain the relative stability of human resources. On the one hand, human resource policies of M&A company must be passed to employees, which could guide them to come into a new vision system to get the organizational cohesion rapidly. On the other hand, managers in the human resources department and related departments should communicate timely with staff to obtain the understanding and support of the staffs. Second is to focus on retention and integration of key personnel. The key personnel have the characteristics of strategic assets. Whether retain the key personnel or not is the successful determinant of M&A in a sense.

(4) Organizational integration. Organizational integration is to make the necessary adjustments or

reconstruction in the organizational structure and management system after M&A in order to achieve the organizational synergies. M&A integration process is the timing of the process reengineering to counteract the rigid core of the organization. M&A companies could establish a positive organizational mechanisms to encourage various business units to pursue their association and overcome the difficulties of inherent coordination and communication<sup>[7]</sup>.

(5) Management System Integration. Management System Integration after M&A is mainly reflected in the integration of management systems. Both sides should achieve a unified criterion and complementary advantages, and result management synergies in research and development, production, marketing, finance, personnel and other functions.

(6) Cultural integration. Cultural integration related to the values of both sides, business philosophy, behavior standard and work style, with indoctrinating and transplanting from superior culture to inferior culture. Different cultures have different organizational adaptability so that the difficulty of integration is different and a pertinent strategy should be adopted in line with local conditions. Cultural integration is the key factor in mergers and acquisitions strategy and long-term operating performances. It is also the final successful sign of mergers and acquisitions.

Cultivation, strengthen and transplantation of the core competence is a short-term process of development, its' process of accessing and enhancing is dynamical and infinite loop<sup>[8]</sup>. The business organization must be innovative to obtain long-term development<sup>[9]</sup>.

### 3.4 M&A consolidating period

In this period the core competence will be enhanced and upgraded. After passing M&A integrating period smoothly, the M&A process has been made initial success at the organizational level. But at the strategic level, it is uncertain that there is significant market effect in the core competence. Therefore, the consolidation of M&A is the necessary extension of building and enhancing the core competence. It is necessary in this stage not only to develop and establish core products in various business, but also to realize interaction development and virtuous circle between M&A and core competence in the strategy.

## 4 Conclusion

Successful M&A can bring a huge positive effect, and M&A in failure can allow enterprises to pay a painful price reversely. Chinese companies need seriously consider overseas M&A risks and have a clear understanding to take appropriate mode. From the perspective of the core competence, a clear and viable model of mergers and acquisitions has been established in this paper. This one is just like the mode of "Total Quality Management", and it emphasizes the enterprises should penetrate the building, nurturing, strengthening and enhancing of the core competence into the whole process of M&A on the base of careful evaluation itself.

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## **Analysis on Management Culture Mode and Selection over Large-scale Enterprise Groups\***

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**Abstract:** With further economic globalization, fiercer market competition, and the enterprise paying more attention to the soft management today, strengthening the research of enterprise management culture, setting up the business enterprise management culture and implementing cultural management is the strategic choice of large enterprise group in China to change the development mode and raise the level of management, and it is also an advanced topic that needs to be solved to promote the soft power of large enterprise group culture. For large enterprise group management culture mode, there is no authoritative result in academic field. In this paper, the author puts forward some models of the large enterprise group management culture by using system theory and comparison analysis, and summarizes the development paths of the group management culture through the analysis and comparison, and it is concluded that the highest level of the selection and construction of management culture model is humanistic innovative management culture mode.

**Key words:** large enterprise groups; Management culture; Humanistic innovative; Game theory

### **1 Introduction**

More than 30 years, the enterprise culture has been defined from different angles by the scholars domestic and overseas, and it also has been known by many entrepreneurs and managers. However, there's very little research on enterprise management culture. Enterprise management culture actually is using the enterprise culture in management, it is the management method, management features and management standard which carry and perform the enterprise culture, it is the management style and management behavior generated by effectively conducted enterprise culture through the management activities, it is the important performance of enterprise culture. There's very little conclusion on how to choose the enterprise management culture mode both in China and overseas, therefore this paper will do some analysis on this topic.

### **2 Some Modes of Large Enterprise Group Management Culture**

From the enterprise managers' ways of thinking and behavior, we think there are four modes of large enterprise group management culture:

#### **2.1 Experience adherence type**

Experience adherence type, is based on empirical thinking, paying a lot attention to the traditional management experience, adhering the existing knowledge, reacting slowly on the outside environment changes, behaving more conservative, pursuing steadiness, making decisions with experience, with the management value orientation venerating historical traditions, worshiping past experience, paying great attention to the material factors, ignoring human value, stressing rule of man, a lot of freedom in management, and with the goal of management making money, and stable.

#### **2.2 System control type**

The system control type management culture mode, is based on scientific thinking, paying a lot attention to the system construction, believing in scientific rules, holding the mature management system, perfecting management system, emphasizing the uniformity of members' thoughts and behaviors, achieving the strict top-down management by increasing the management level, detailing the management rules and establishing management process, pursuing the best quality effect and avoiding business risks. The management value orientation is venerating authority, worshiping authority, obeying disciplines and commands, controlling the behavior of people, stressing the rule of law, disliking changes, reacting slowly to the market, and the management goal is to be stable and profitable.

#### **2.3 Entrepreneurs guide type**

Entrepreneurs guide type management culture mode, is based on the entrepreneurs' thinking, paying great attention to the concept of innovation, using entrepreneurs' idea for leading the

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development direction of enterprises, forming a management culture pattern that is “one people gives thoughts, all the others response”, emphasizing the use of entrepreneurship to cast enterprise spirit, expanding cultural influence through the entrepreneurs’ personal charisma, the management value orientation is venerating leader authority, worshiping personal thoughts, relying on entrepreneurs personal thoughts, highly obeying the rules, stressing the rule of man but also stressing the rule of law, and the management goal is to control and be profitable.

#### **2.4 Humanistic innovative type**

Humanistic innovative management culture mode, is based on humanistic thought, paying much attention to the value of the people, giving prominence to the subjective position of human, emphasizing constantly changes of ideas, promoting the management innovation, mechanism innovation, and technological innovation, and guiding the enterprise by scientific outlook on development. Humanistic innovative management culture mode creates a learning organization to construct an enterprise culture of progressive thinking, correctly guiding, highly appreciated by the staffs and all members practice together, strengthens knowledge management, constantly improves the learning ability, innovation and enterprise brand power, uses the innovation spirit to cast the enterprise cultural soul, uses the enterprise culture to build the enterprise’s core competitive ability, and stresses the rule of culture. The management value orientation is venerating the human nature, worshiping the innovation, advocating performance, conducting a humanistic management, respecting subjective position of human, arousing people’s creative potentials, and the management goal is social responsibility, harmony, stability and healthy development.

### **3 Comparison of Large Enterprise Group Management Culture Modes**

The four large enterprise group management culture modes have different characteristics, according to the general rules of the management culture (as shown in table 1).

Experience adherence management culture is characterized by taking the empiricism as the main way of thinking, relying on the experience to make decisions, lacking of strategic thinking, and the vision is limited. From their behavior, they emphasize the material factors, overlook the human factors easily, pay less attention to subjective position and enthusiasm of human, and the management has too much freedom, a typical human-dominated management, depending on the experience of the manager. Their goal is to maintain a high degree of stability, taking profit as the most important task.

Compare with the experience adherence management culture, the system control type make a big progress from thinking mode to behavior pattern. The system control type emphasizes scientific thinking, advocates to think and measure the management problems by scientific spirit and scientific method, in order to get rid of the dependence of past experience, to overcome the defects brought by empirical thinking. They emphasize particularly on construction of system, stress rigid management, control the enterprises by carrying out strict management through power of system, avoid the operation risk and arbitrary management, and it is rule of law. Their goal is to put the profit in the first place, emphasizing solid management and steady operation.

Compare with the system control management culture, the entrepreneurs guide type makes a progress again. It is characterized by taking the entrepreneurs’ thinking as the weapon, making concept changes, venerating leader authority, relying on personal wise, and entrepreneurs’ wisdom is their philosophy weapon in business operation. They emphasize team obedience, stress rule of man, are good at diversified management, and the management goal is to pursue enterprise stability and control operating risk.

Humanistic innovative management culture is by far the most desirable management level, far more advanced than experience adherence type, system control type and entrepreneurs guide type, and it is the management culture form which fits the cultural administrative requirements best. Humanistic innovative management culture is characterized by humanistic thinking. It starts and ends both in people-oriented ways, and it emphasizes improving the relationship between man and man, man and enterprise, man and society, man and nature by integrated development of man, so as to promote the development of the enterprise. It puts emphasis on exerting subjective initiative, venerating human value, keeping continuous innovation and constantly changes by improving the team learning and relying on collective function of the leaders rather than the personal talent, stressing the rule of culture, and their goal is to put the social responsibility, harmony and stability, healthy development at the first place.



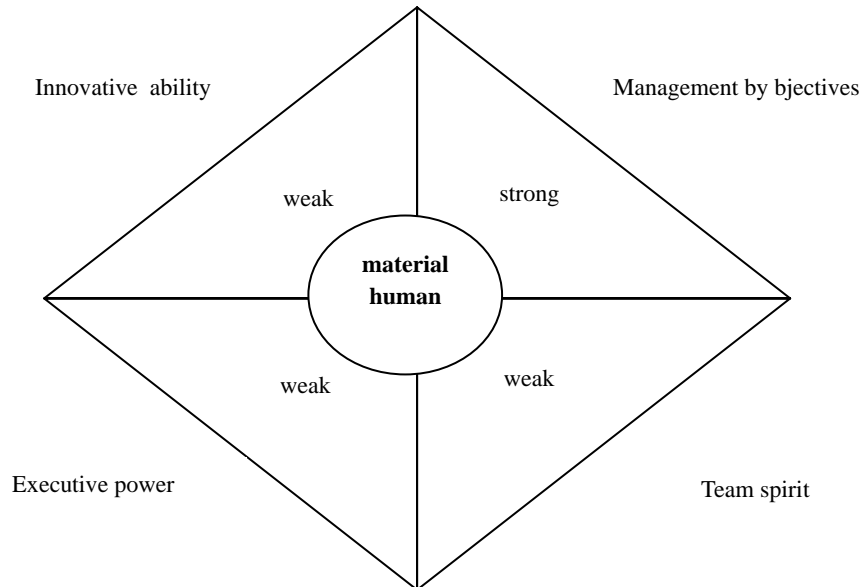
**Table 1 Comparison of four management culture modes**

Character	Type	Experience adherence	System control	Entrepreneurs guide	Humanistic innovative
Content					
Thinking pattern		empiricism	scientism	entrepreneurs	humanistic
Ideas of management		Venerate historical traditions, worship past experience, pay great attention to physical factors	Venerate system construction, worship authority, stress obeying disciplines and commands	Venerate changes of ideas, worship leader authority, rely on individual thoughts	venerate human nature, worship the innovation, construct learning organization
Ways of management		Rule of man, emphasize materials	Rule of law, emphasize system	Rule of man, emphasize obedience	Rule of culture, emphasize culture
Goals of management		Stable and profitable	Profitable and steady	Stable and control	Social responsibility, harmony and stability, healthy development

#### 4 Competitiveness Value Analysis of Large Enterprise Group Management Culture Modes

Currently because large enterprise group management culture modes are different in the way of thinking and behavior patterns, competitive values (as shown in Figure 1, Figure 2, Figure 3, Figure 4 and Figure 5) are also far different, and this can provide reference for large enterprise groups to choose the most appropriate management culture mode.

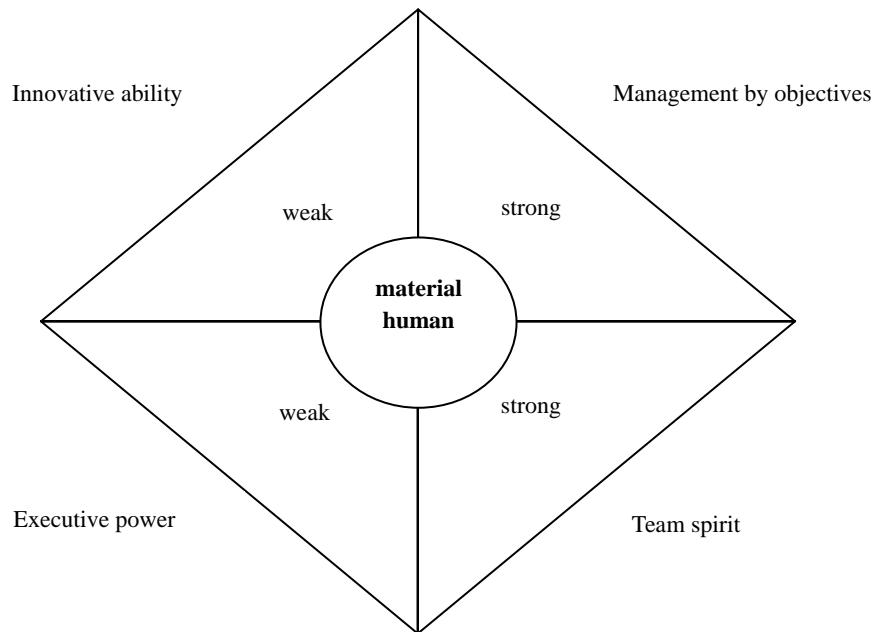
Experience adherence management culture values the function of target, but pays less attention to the team spirit, easily to have some friction in work, the execution is casual, the innovation ability is weak, they stress materials rather than human, and therefore the competitiveness is the lowest. The Giants, the Sanzhu Group and the Asia Enterprise were all of this type and failed in management.



**Figure 1 Competitiveness Value of Experience Adherence Type**

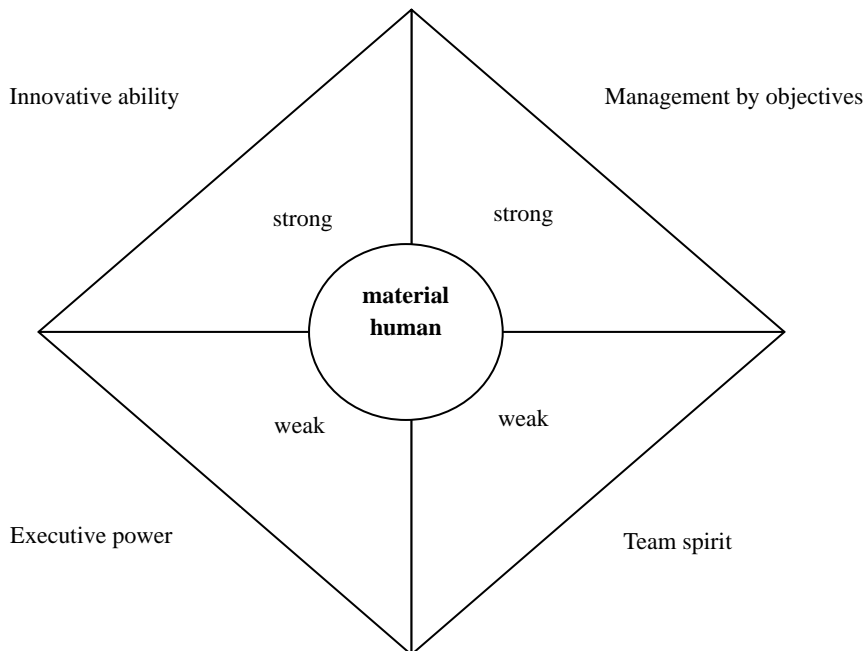
The system control management culture has a strong consciousness of target management and teamwork spirit, but the execution is easily to be bounded, the innovation ability is weak, and it pays

more attention to material rather than human. So the competitive power is also limited. Most of the state-owned enterprises and many of the joint ventures are of this type of mode.



**Figure 2 Competitiveness Value of System Control Type**

Entrepreneurs guide management culture thinks highly of goals, emphasizing the target management, focusing on enterprise innovation, but the team spirit and execution are likely to be fluctuated and not stable. Although it stresses human and has some competitiveness, the enterprise development depends too much on entrepreneurs' personal wisdom. Once there is something wrong with the entrepreneurs' decision, thinking or behavior, the enterprise is in risk. Family enterprise, most private companies, some collective enterprises and some state-owned enterprises are of this type, such as Lenovo Group, BYD Group, Wahaha Group, Shenzhen Sam training company and Huawei etc.



**Figure 3 Competitiveness Value of Entrepreneurs Guide Type**

Humanistic innovative management culture has a good targeted management mechanism,

venerating teamwork, stressing the culture of teamwork, having strong executive powers and innovation abilities, it attaches great importance to human value, and it has highest competitive value. There are a few domestic enterprises have courage to change in the wave of market economy, are good at learning, gradually form a humanistic innovative enterprise culture characteristics, and some of them have grown to benchmarking enterprises in the industry or even in the whole country, such as Dongfeng Automobile Company, Baosteel group, Shanghai Automobile Company and First Automobile Works etc.

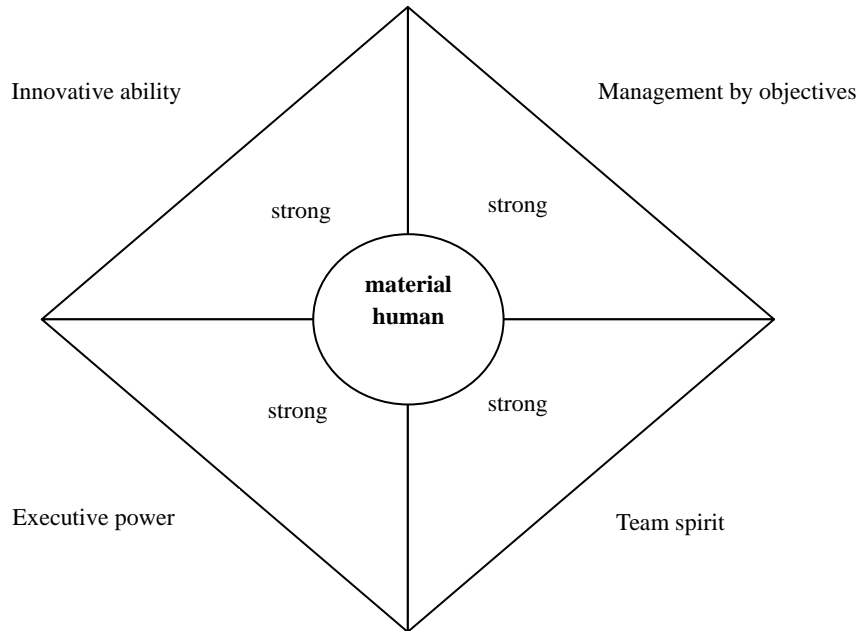


Figure 4 Competitiveness Value of Humanistic Innovative Type

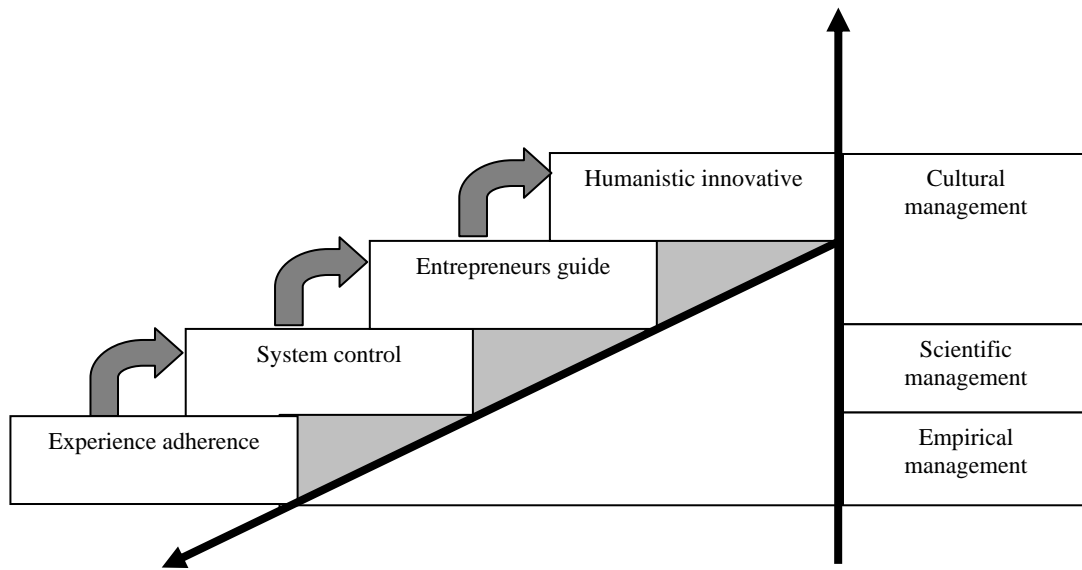
### 5 Selection of Large Enterprise Group Management Culture Modes

From the analysis above, we can see that in the four different enterprise group management culture modes, the humanistic innovative type has the most competition value. It has the best growing prospects of development, the greatest influence on the enterprise development, the largest impact to improve the competitiveness of the enterprises; the next is the entrepreneurs guide type, then is system control type, and the lowest level is experience adherence type. In the circumstance of knowledge-based economy emphasizing cultural management, large enterprise groups should choose humanistic innovative type, and gradually transfer from the other three types to the humanistic innovative management culture mode.

For large enterprise groups, the process of culture management will go through four stages up, which also make the enterprises more and more competitive. As the model in Figure 9, the four stages match along with three stages of the development of management practice too. As the model reveals, nowadays the construction of culture management should evolve from experience adherence or system control types towards humanistic innovation, which meets the needs of culture management. Though entrepreneurs guide type is also the manifestation of culture management, this form of culture management is restricted by individual factors, which makes enterprise develops wholly depending on wise decisions of an individual. This type of culture psychology is far from an optimum cultural ecology of culture management. The optimum cultural ecology is the one that focuses on humanistic innovation.

### 6 Conclusion

To construct the most competitive and energetic enterprise management culture, the enterprise should slip the leash of empiricism adherence and system control, break the culture limitation of entrepreneurs guide and weave the humanism-oriented and team innovation-oriented culture, meeting the demands of scientific development of culture management. If the construction of culture management came to a standstill or failed to step to new stage or level, the ecology and competitiveness of culture management would drop, pulling down the competitiveness of the whole enterprise.



**Figure 5 Relationship of Management Culture Mode, Competitiveness and Management Development Stage**

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# International Trade among Developed and Developing Countries: New Empirical Analysis

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**Abstract:** This paper argues that technological innovation and transport infrastructure investments are important factors in bilateral trade, especially for developing countries, through the econometric model. What are proposed by this paper is that geographical and cultural factors are more important for developing economies than developed economies. The econometric model includes value of import, income, population of both countries and seven different dummies. Finally it reaches the conclusion that the investments in technological innovation and in transport infrastructure have shown great influence on the volume of trade.

**Key words:** International trade; Technological innovation; Transport infrastructure; Gravity equation

## 1 Introduction

Traditionally, when estimating a gravity model of trade, it is implicitly assumed that the coefficients of all the explanatory variables are the same for all the trading patterns. Empirically, this requires relaxing the pooling assumption. Throughout a lot of papers, they often neglect some auxiliary conditions because of the restriction of some assumptions.

In this paper we test the pooling assumption in a gravity model augmented with technological innovation and transport infrastructure variables for 62-country samples. The aim is to evaluate the empirical effects of technological innovation, transport infrastructure, cultural and geographical factors on international trade. We find that the significant sign of the explanatory variables depends on the certain characteristics of trading partners. Thus, the samples are divided into two groups of countries according to their level of income labeled developed countries and developing countries. The estimation results show important differences concerning the goodness of fit as well as the significance and magnitude of the variable coefficients. The next section demonstrates data and the estimated equation. The main empirical results are manifested in the following section. Finally, in Section 4 we outline our conclusions.

## 2 Data and Estimated Equation

### 2.1 Construct the regression equation

In order to evaluate the empirical effects of technological innovation, transport infrastructure, cultural and geographical factors in international trade, we use a gravity model (Deardorff, 1995; Anderson and van Wincoop, 2003) augmented with technological variables and a transport infrastructure index. A number of dummies representing geographical and cultural characteristics are also added. The model is expressed in additive form, using a logarithmic transformation. The estimated equation is:

$$\begin{aligned} \ln X_{ij} = & \alpha_0 + \alpha_1 \ln Y_i + \alpha_2 \ln Y_j + \alpha_3 \ln P_i + \alpha_4 \ln P_j + \alpha_5 Adj_{ij} + \alpha_6 Isl + \alpha_7 Land + \alpha_8 CACM + \\ & + \alpha_9 CARIC + \alpha_{10} MERC + \alpha_{11} NAFTA + \alpha_{12} CAN + \alpha_{13} UE + \alpha_{14} \ln Dist_{ij} + \alpha_{15} Lang_j + \\ & + \alpha_{16} ArCq + \alpha_{17} ArCq + \alpha_{18} difArCq + \alpha_{19} \ln f_i + \alpha_{20} \ln f_j + u_{ij} \end{aligned} \quad (1)$$

where  $\ln$  denotes natural logarithms,  $X_{ij}$  denotes the value of exports from country  $i$  to  $j$ ,  $Y_i$  and  $P_i$  refer to income and population in the exporter's market,  $Y_j$  and  $P_j$  refer to income and population in the importer's market,  $Adj_{ij}$  is a dummy that takes a value of 1 when countries share the same border, otherwise, it takes 0.  $Isl$  takes a value of 1 when the exporter or the importer are islands, else takes 0.  $Land$  is a dummy for landlocked countries,  $CACM$  is a dummy that takes a value of 1 when both countries belong to the Central American Common Market,  $CARIC$  is a dummy that takes a value of 1 when both countries belong to the Caribbean Community,  $MERC$  is a dummy that takes a value of 1 when both countries belong to Mercosur,  $NAFTA$  takes a value of 1 only when countries are members of the North American Free Trade Area,  $CAN$  is a dummy representing Andean Nations Community members and  $UE$  takes a value of 1 only when countries are members of the European Union.  $Dist_{ij}$  is

the geographical great circle distance in kilometers between the capitals of country  $i$  and  $j$ .  $Langij$  is a dummy when both countries sharing the same language,  $ArCoi$  and  $ArCoj$  are technological variables measuring technological innovation in the exporter and the importer countries and  $difArCoij$  is the technological gap between trading partners (Filippini and Molini, 2003). This indicator is based on the insight that two countries can be far away from each other not only geographically, but also from a technological perspective.  $Inf_i$  and  $Inf_j$  are infrastructure variables measuring the level of transport infrastructures in the exporter and the importer countries. Finally,  $u_{ij}$  is independently and identically distributed among countries.

**2.2 Obtain the related data**

The model is estimated with data of 62 countries in 1999. First, we perform OLS estimation on the double log specification as given by equation (1). However, since almost 20% of the observations in bilateral trade flows are zero, then a Tobit model is estimated in order to take the missing trade into account.

Data in bilateral exports are obtained from Statistics Canada (2001), income and population variables are from the World Bank’s World Development Indicators (2001). Information about geographical and cultural dummies is from the CIA (2003) and the data for ArCo are obtained from Archibugi and Coco (2002).

In order to understand whether a differential behavior concerning the determinants of trade flows in developed and developing countries exists, we estimate equation (1) by interacting the exogenous variables (except integration dummies) with a dummy (DP)<sup>3</sup> that takes the value of 1 when trading partners are richer than the simple average in our sample. DP takes the value zero when trading partners are poorer than the simple average in our sample. We use the Wald test in order to check whether both exogenous variables and its interaction with the dummies can represent that developed countries present a different coefficient. We reject the null hypothesis of equality of the coefficients in the two sub-samples (developed and developing countries). Table 1 shows our final results.

**Table 1 Multiple Linear Regression Model**

Variable	OLS (1)	OLS (2)	TOBIT (3)
Constant term	-19.36*** (-32.05)	-22.11*** (-28.97)	-48.36*** (-32.6)
Exporter’s income	0.04*** (5.69)	0.04*** (5.01)	0.05** (2.3)
DP*Exporter’s income	-	0.48*** (2.97)	1.61*** (3.29)
Importer’s income	0.05*** (4.64)	0.04*** (3.74)	0.06*** (2.73)
DP*Importer’s income	-	0.57*** (3.6)	1.67*** (3.5)
Exporter’s population	0.98*** (55.1)	1.08*** (51.81)	1.64*** (36.1)
DP*Exporter’s population	-	-0.76*** (-4.26)	-2.61*** (-5.1)
Importer’s population	0.72*** (37.46)	0.78*** (35.43)	1.15*** (26.72)
DP*Importer’s population	-	-0.66*** (-3.89)	-2.27*** (-4.59)
Adjacency dummy	0.24 (1.52)	0.66*** (3.12)	1.45*** (3.01)
DP*Adjacency dummy	-	-0.45* (-1.76)	-0.78 (-1.01)
Island dummy	-0.31*** (-3.72)	-0.38*** (-3.42)	0.12 (0.59)
DP*Island dummy	-	0.11 (0.79)	-0.71* (-1.84)
Landlocked dummy	-0.97*** (-12.92)	-0.85*** (-8.98)	-1.29*** (-7.12)
DP*Landlocked dummy	-	0.12 (0.99)	-2.22*** (-6.28)
CACM dummy	2.39*** (9.55)	2.24*** (7.72)	5.68*** (5.51)
CARICOM dummy	3.91*** (3.89)	3.92*** (3.87)	6.24*** (2.59)
MERCOSUR dummy	2.76*** (8.5)	2.16*** (5.55)	4.18*** (3.99)
NAFTA dummy	1.2 (1.51)	1.31*** (3.17)	1 (0.71)
CAN dummy	0.89* (1.87)	0.18 (0.38)	0.35 (0.14)
UE dummy	-0.26** (-2.45)	0.13 (1.56)	1.24*** (3.36)
Distance	-0.91*** (-24.13)	-0.97*** (-19.55)	-0.47*** (-5.17)

DP*Distance	-	0.25*** (3.69)	0.29 (1.57)
Language dummy	0.83*** (9.81)	1.04*** (10.63)	3.02*** (15.18)
DP*Language dummy	-	-0.53*** (-3.12)	-2.24*** (-5.11)
Exporter's ArCo	8.04*** (48.74)	9.77*** (38.05)	14.43*** (29)
DP*Exporter's ArCo	-	-5.67*** (-12.46)	-8.53*** (-6.19)
Importer's ArCo	5.68*** (32.69)	7.15*** (26.49)	9.97*** (20.15)
DP*Importer's ArCo	-	-5.48*** (-12.12)	-6.25*** (-4.57)
Technological distance	-1.93*** (-11.61)	-3.09*** (-13.82)	-2.76*** (-6.09)
DP*Technological distance	-	1.91*** (4.58)	2.18 (1.64)
Exporter's infrastructure	0.88*** (24.89)	0.92*** (18.57)	1.38*** (11.27)
DP*Exporter's infrastructure	-	-0.24*** (-3.45)	-0.29 (-1.43)
Importer's infrastructure	0.71*** (16.94)	0.8*** (12.62)	1.27*** (10.72)
DP*Importer's infrastructure	-	-0.41*** (-4.86)	-0.47** (-2.33)
R-squared	0.789	0.808	-
Adjusted R-squared	0.788	0.806	-
S.E. of regression	1.499	1.437	-
Log likelihood	-	-	-8938
Scale Factor	-	-	3.37*** (75.25)
Number of observations	3126	3126	3782

Notes: \*\*\*, \*\*, \*, indicate significance at 1%, 5% and 10%, respectively. T-statistics are in brackets. The dependent variable is the natural logarithm of exports in value (current US\$). Income, population and distance are also in natural logarithms.

### 3 Empirical Results

#### 3.1 Equation via t-test

Model 1 shows the estimation results for equation (1). All the explanatory variables are significant via t-test and show the expected sign, except for UE dummy. However, the magnitude of the income coefficients is lower-than-expected. The adjacency coefficient has the expected positive sign, but it is not noticeable. The landlocked coefficient is negative as expected, indicating that countries without direct access to the sea trade 62% less. The island dummy is negative, as expected. The language dummy coefficient is positive and indicates that countries sharing the same language trade 129% more than those speaking different languages. The European Union dummy coefficient is negative signed and statistically significant. Although this result has been found by other authors (Cyrus, 2002), we believe that the reason may be the presence of heterogeneity in the sample or the existence of zero values. Technological distance ( $difArCo_{ij}$ ) is significant, indicating that countries tend to trade more when they place more emphasis on a technological point of view. The model has a high explanatory power (Adjusted  $R^2 = 78.8\%$ ).

#### 3.2 Equation with iteration dummies included via Wald test

Model 2 presents the results of low income countries as well as high ones, with the inclusion of iteration dummies. The results from the Wald test show that the probability assumption is indeed rejected in bilateral exports and that the estimated parameters are not identical in bilateral relationships. Income variable has a more close relation to developed countries. A 1% increase in own GDP increases exports from developed countries by 0.52% (0.04%+0.48%), while only increases 0.04% when exports are from developing countries. Very similar coefficients are obtained from foreign GDP. This may indicate that the cost and revenue of integration and globalization could be unevenly distributed among the richest and the poorest countries and the former can benefit from this distribution. The coefficients of population variables show positive signs, but show a very low magnitude for developed countries and present a magnitude close to unity for developing countries. This indicates that greater availability of cheap labor force in developing countries can stimulate trade, whereas in

developed countries the transition is over and the trend of population growth is stable. The magnitude of the distance coefficient is lower in developed countries,  $-0.72$  ( $-0.97+0.25$ ), than in developing countries,  $(-0.97)$ . The adjacency dummy coefficient is  $0.45\%$  lower in developed countries and also the language dummy is lower ( $0.53\%$ ) when it comes to the developed. Therefore, results show that trade flows are more sensitive to geographical and cultural variables (adjacency, geographical distance and language) for developing economies than for developed economies. Since developing countries face higher transport costs, higher institutional and informal barriers, and more limited access to market information, they tend to trade more with their neighboring countries. The result that language links have an impact on international trade has also been found before, and the former research has shown that language influences on trade are more significant in China (a developing country) than in the U.S. (a developed country). The estimated coefficients for technological innovation and infrastructure variables are always significant and higher in magnitude for developing countries. Hence, technological innovation and transport infrastructure investments seem a good policy for developing economies.

### 3.3 Equation by Tobit estimation

Finally, Model 3 reports the Tobit estimation of the gravity equation with the interactive terms included. The results show several distinctive features compared to those obtained in Model 2. It is income variables for the exporter and the importer that show a higher magnitude in developed countries ( $1.66$  and  $1.73$  respectively) than in the OLS estimation. Population variables for developed countries now present negative coefficients ( $-0.97$  and  $-1.12$  respectively), indicating that an increase in population hinders the trade. This may be due to an absorption effect. The adjacency dummy has a coefficient for developing countries that is twice than that in Model 2 and also the effect of some integration dummies is amplified (CACM, CARICOM and MERCOSUR). However, the NAFTA and CAN dummies are not significant and the EU dummy is now positive and significant. Geographical distance has a considerably lower effect on trade for developing countries and the coefficient for the interactive variable is positive but not significant, whereas language, technological innovation and transport infrastructure have a higher effect on trade flows, for both developed and developing countries than in Model 2.

## 4 Conclusions

In a conclusion, it is proved that the volume of trade is not only impacted by geographical and cultural aspects but also affected by investment in technological innovation and in transport infrastructure.

With respect to trade, there are still other factors which can influence bilateral trade flow, such as humanitarian aid from developed economies and some good economic policies. This paper only analyses some certain variables by using a gravity equation and verify the hypothesis. Other factors were still worthy to be considered.

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## Innovative Activities within Online Brand Community: A Grounded Analysis Based on Netnography\*

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**Abstract:** Online community has been proved to be a new source of innovation by many scholars. But, innovative activities within online brand community attracted few academic studies. This paper uses netnography to collect data and analyzes by coding based on grounded perspective. 16 key activities are identified to be innovation relative according to their frequency of importance. These activities are involved the three major stages of innovation process, idea generation, developing and testing, and launch and marketing, and the brand community members are most active innovators in idea generation.

**Key words:** Brand Community; Innovative Activity; Netnography; Coding

### 1 Introduction

The phenomenon that customers invent or improve a product for their own consuming is not a new fad just after Web 2.0 appeared. In more than three decades, many scholars had explored it and named it different way.

Toffler defined prosumers as people who produce some of the goods and services entering their own consumption, for example, designing customized clothes. He argued that driven by more leisure time, empowering computers and telecommunications technology, rising service costs, higher education as well as sensitivity for quality and conscious lifestyle, the norm of society shifted from mass consumption to individuation, spotlighting self-actualisation. Hence, consumers as phenomenon of the industrial age were shifting to prosumers in the post-industrial age. Toffler's prosumer thesis was extended by Kotler in 1986 to the context of marketing, stressing individuation, skill-building, and productiveness as relevant marketing themes. Kotler concluded already in the pre-new media age that marketers should look for opportunities to facilitate prosumption activities by creating tools for prosumers to use.

Von Hippel first reported that the central role of innovators can also be users in the 1970s. He defined users as individual consumers or firms that expect to benefit from using a product or a service, while manufacturers often expect to benefit from selling a product or service to their customers. von Hippel noticed the trend of open innovation and distributed innovation, and then introduced the concept of "User centered innovation". This generalized concept includes the phenomenon that manufacturers absorb user innovators' ideas and introduce them into the mass market. In this case, the final innovation is possessed by established manufacturers; however, source of ideas is partially from users. Usually, lead users are more active in the formation of user centered innovation.

Customers' wants and their acquired knowledge through the actual use of products make them an essential external resource for innovation. Some customers are not only knowledgeable but also able to develop their own new products. Such innovative customers can be found in online communities. Such online communities are based upon shared enthusiasm for an issue or an activity and are often virtual meeting places for innovative users to discuss the ideas for product improvement. In "alt. coffee" for example, community members share their ideas and thoughts about how coffee machines and roasters can be improved in order to enjoy the optimal coffee pleasure. At niketalk.com, an online community for devoted basketball players, new basketball shoes are developed by users. The new designs are discussed, evaluated and improved within the community. Members of communities of consumption seem to be particularly suitable for the virtual participation in new product development because of their high product interest and knowledge as well as presence on the Net. Analyzing four different sports communities Franke and Shah showed that on average one third of the community members improve their sports equipment or even design their own products. Moreover, these members are well informed regarding the innovative activities of other community members.

While the role of innovative users in online communities has enjoyed significant development in

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the literature, a number of gaps remain. Although some authors have used brand communities as virtual settings for their studies, few authors have explored the user innovation in online “brand” communities as specific contexts, with unique characteristics different both from offline settings and from not-brand-related online communities. The purpose of this article is to address the question of “what are innovative members doing in the user-initiated brand community” by generalizing and classifying the major innovative activities within the brand community, which is the first step to understand the user innovation phenomenon in the specific brand community context.

## 2 Literature Review

### 2.1 Brand community

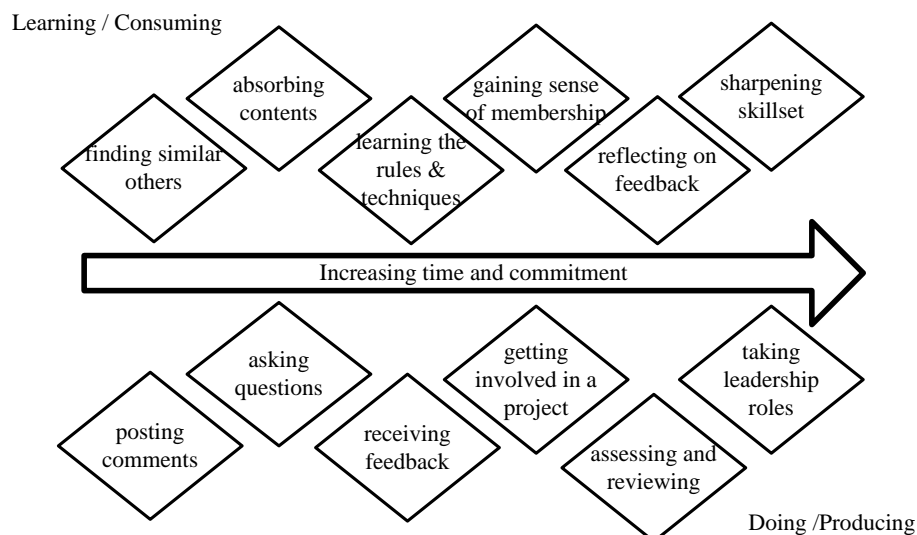
The notion of brand communities was developed by Muniz and O’Guinn as “a specialized, non-geographically bound community, based on a structured set of social relations among admirers of a brand”. Brand communities are complex entities with their own cultures, rituals, traditions, and codes of behavior<sup>[13]</sup>. Members of a brand community derive much of their personal identity from their participation and membership. In other words, in brand communities conversations are centered on a specific brand and usually passionate members are consumers of the brand.

Brand communities differ from other not-brand-related communities because the three distinguishing features, namely consciousness of a kind, rituals and traditions, and sense of obligation to the community and its members. Compared to not-brand-related community, brand community members have a strong interest in the product and in the brand. They usually have extensive product knowledge and engage in product-related discussions; they support each other in solving problems and generating new product ideas. Therefore, brand communities can be a valuable source of innovation.

So far, most researches in this field elaborated on the relationship between membership and brand loyalty, brand identity and so on, which apparently are the traditional downstream realm that brand works, few researchers linked brand community with upstream activities such as technology innovations.

### 2.2 Community innovative activities

Kozinets, Hemetsberger and Schau presented a processual model of community activities, separating learning from doing, and implicitly separate production of information from its consumption. He argued that in a perpetual loop of learning and doing, aspirant members “research” their sites of interest, absorb the rich stores of information and social and collective knowledge. Kozinets believes that this is grassroots informationalism; informationalism enacted at the small-scale level of consumer “hobbies” and “interests.”



**Figure 1 Processual Model of Community Activities**

Source: Kozinets, et al, The Wisdom of Consumer Crowds: Collective Innovation in the Age of Networked Marketing, 2008

Figure 1 depicts this dimly specified progression from lower-value content contribution to higher-value content contribution, the involvement process is based on feedback and self-identification, a combination of affective ideological, social motivation, and educational intellectual commitments.

Later, some consumers assume leadership roles. They provide feedback, critically evaluating, vetting, and challenging. In a constant process of idea contribution, they advise and mentor the more novice members, aggregate similar contributions, and review and challenge current contributions. In these ways, collective creativity develops and produces “content” that exceeds the value that could be provided by single individuals. Eventually, communities may develop hierarchies of expertise, as we observe within many open-source and fan communities.

The wisdom of consumer crowds” is the only work which is accessible for the author that elaborates on “Collective Creative Activity”, which overlaps a lot with the term “virtual community innovative activity”. Although many authors mentioned innovative activities in their research paper such as information seeking, knowledge sharing, problem solving and co-creating, few researches really focus on studying these activities. Most of the community innovative behavior researches focus on motivations and influencing factors of joining, sharing and innovating in community and leave the following questions behind: What are the activities that the community members do most frequently? What are the activities that contribute more to the user innovation? If there are any specific activities that could only be found in brand community? All above questions need to be addressed because it helps managers to get better understanding of brand community innovation and thus develop better approach of co-creation with the loyal customers.

### 3 Methodology

Netnography, or ethnography on the Internet, is a qualitative consumer research methodology that uses the information publicly available in online forums to identify and understand the needs and decision influences of relevant online consumer groups. Of course it could also be used to study the nature and behavior of online consumer groups. Netnography is based primarily upon the observation of textual discourse.

For this study, the netnography divides into four steps: (1) community identification and selection; (2) sampling; (3) screening and coding; (4) interpretation of findings.

#### 3.1 Community selection

Kozinets listed several guidelines for community selection: (1) a more focused and research question relevant segment, topic or group, (2) higher “traffic” of postings, (3) larger numbers of discrete message posters, (4) more detailed or descriptively rich data, and (5) more between-member interactions of the type required by the research question.

According to above principles, an online Mac community called MacIdea is chosen as the study objective. MacIdea is an online forum initiated by several Apple Mac admirers and a technology community called Pcbeta, one of the best forum focused on Windows operation systems in China. This origin brings a “hybrid” character for MacIdea: it has members of technical background which makes it different from other apple forum mainly visited by users who care most about download App software; and it is also different with the forums gathered by Apple developers because the “pure” users and admirers talk about their love to Apple and Jobs makes it a qualified “brand community”. The “hybrid” character ensures MacIdea to be an ideal setting for this research because of its high relevancy with “brand” and “innovation”.

MacIdea shares a 210,000 plus membership with Pcbeta, and over 25,000 respective registered members for its own. The large membership volume guarantees the enough “traffic” of posting.

#### 3.2 Sampling

The heavy traffic load of posting makes the read-all-posting-plan a mission impossible, a sampling method is proved more feasible. A random sampling is used to choose 200 members from a check-in topic which calls newcomers to post and have more than 20000 members followed. That is, to choose 200 numbers from 1-20000 randomly, use one random numbers to match the order number of the floors within that check in topic, and then identify one poster. The next step is to use the poster’s name as keyword to search within the forum with google provided by MacIdea so as to find all his posting messages recorded. In that way, 2246 postings from 200 members were collected and screened.

Another sampling method adopted in this research is theoretical sampling. One of innovative projects discussed under sub forum “Independent Developer”, focused on a video player on Mac was

chosen to ensure “more between-member interactions of the type required by the research question”. 2075 postings were collected from this MplayerX projects discussion.

**3.3 Screening and coding**

Totally 4000 plus postings were read word by word. Data relative to innovation is copied and coded until getting enough messages to achieve theoretical saturation.

The initial coding is based on every message and every message was given several coding, varies from activity form (initiating a topic or just reply); content (advices or bug reporting or etc); commitment (simple or detailed); category (from which sub forum, Mac or iphone).

The second step is to do focusing coding according to the frequency and importance of initial coding.

And the last step is the axial coding. The items generated from focus coding were categorized into groups according to innovation process model.

**4 Findings**

**4.1 Innovative support from community members in MplayerX project**

MplayerX is a video-playing tool developed for Mac. It is compiled on Mplayer, an open source software under Linux. The developer initiated the project individually in 2009, launched the first edition on January, 2010, and its latest edition is available on shelf of App Store for free since March, 2011. The MplayerX forum of MacIdea was opened on June, 2010. From then on, the developer and community members keep on discussing about the project, and the developer got technical, emotional and economic support from the community. And the innovative support can be found in three innovation stages of conception, developing and marketing. The following table lists some of the examples.

**Table 1 Brand Community Support for Innovative Project MplayerX**

support from members	examples
technical support	advices on new function
	advices on new features
	language translation for Chinese edition, and traditional Chinese edition
	aesthetical design
	software developing advices
	new edition testing
	bug reporting
emotional support	comparison analysis with other video players
	rating and comments in APP Store
	acknowledgement for free sharing
economic support	encouragement to insist upgrading
	donate

**4.2 General innovative activities**

MplayerX is a special example of brand community innovation, because the members are aware of their involvement with the project and make innovative contribution deliberately. According to coding from 200 samples, it is found that in most cases members participate in innovative process unconsciously. The sparkle of innovation is hidden under experience telling, skill showing and even complaining. The following activities in Table 2 facilitate innovation directly or indirectly.

In their processual model of community activities, Kozinets, Hemetsberger and Schau separated learning from doing, and implicitly separated production of information from its consumption. In this model, the learning/consuming activities are non-public behaviors that can't be observed by posting screening. For example, lurks on original innovation posts or uses private message to discuss with other members. These activities may also benefit brand community innovations.

**Table 2 Innovative Activities in Brand Community MacIdea**

Innovation stage	Innovative activities
Idea generation	carrying out surveys on consumer behavior
	comparison analysis of consuming experiences among competitors
	describing expectations for product improvement
	description of decisional consideration in purchasing

	introducing or analyzing new technology or new trend
	demanding special product (for example, Chinese edition of software)
	complaints of product or service
Developing and testing	posting original creation
	seeking for help
	giving technical advices
	bug reporting
Launch and marketing	downloading
	posting comments on innovation
	improvement advices
	advices on price and distribution
	tweet and other propagandas

## 5 Conclusions

Totally 16 innovative activities from 3 different stage in innovation process are identified within MacIdea. Compared with other forms of virtual community, brand community is always product focused. The biggest advantage of brand community in innovation is its product information abundance. High density of product related information greatly help to identify customer needs and wants. The second advantage comes from opinion leaders. Brand community is gathered by loyal customers, who are in many cases more sophisticated users and, in other words, more opinion leaders.

The result may vary with other brand's community because Apple products are high involvement ones and a considerable part of Mac users in China are developers or designers, who are supposed more skilled and more likely to innovate. Further research should be carried out to study the brand community in different industry so as to get a more universal conclusion.

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# Application of the Grey and Multi-linear Regression Combined Model in Reverse Logistics Predictions

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**Abstract:** The accurate prediction of the quantity of reverse logistics is useful to the drafting of industrial development plans and the feasibility research of infrastructure. Taking into account the uncertainties of reverse logistics, this paper uses the two single forecast models, the grey GM (1, 1) and the multi-linear regression models, to model the statistics. Using combination forecast theory, the paper makes predictions based on the prediction effectiveness of the combination forecast model. The results reveal that the accuracy of the combination forecast theory is significantly higher than the two single forecast methods, hence proving the feasibility and effectiveness of the former in predicting the demand for reverse logistics.

**Key words:** Reverse logistics; Grey forecasting multiple; Linear regressions; Combination forecast

## 1 Introduction

“Forewarned is forearmed”. Forecast can reveal objective fact, predict the future development trend and regularity, and play a decisive role in the national economy. In today's China's rapid economic development, resource waste, emissions and waste disposal problems that economic development brings become increasingly protruding coming out now. So, more and more scholars come to realize that the reasonable and advanced reverse logistics industry can make the waste recycling process more scientific, promote waste recycling items and reduce the waste of resources in the process of logistics. However, larger reverse logistics often arises from different kinds of waste materials which mixed together and through different locations. Reverse logistics<sup>[1][2]</sup> has dispersity, slow nature and hybridity, and these characteristics determine it provide rarely reliable and known conditions in its predicting, which make it more difficult to predict much higher than planned stronger positive logistics.

For many years, worldwide scholars have developed a lot of prediction models. At present, the traditional logistics demand forecasting methods mainly include multiple regression models, exponential smoothing, neural network and gray system<sup>[3]</sup> etc. owing to the assume condition and applicable scope of single forecast models are limited, a single prediction model's precision is low. Taking into account the uncertainties of reverse logistics, this paper put forward Grey and Multi-linear Regression Models based on effectiveness.

## 2 Uncertainty Analysis of Reverse Logistics

### 2.1 The uncertainties and solution of return reverse logistics

Return reverse logistics include the following: Commercial return produced by the dealer inventory's deal stock or retailers clearing the backlog of shelves, return to repair or upgrade in quality guarantee period, Regulations return produced by unqualified product. The main causes of these uncertainties are unexpected sale conditions and unstable quality. Because of continuity of these uncertainties, use exponential smoothing and grey theory to forecast can effectively reduce the impact of these factors.

### 2.2 The uncertainties and solution in production process and transportation

The following increased uncertainty of reverse logistics: returned goods of by-product in production process, returned goods of damaged products in transportation, return goods due to error record of user's information. These factors relate to management and transport capacity of enterprises. It's difficult to master these factors, hence grey theory which use a small amount of inexact original data row of the system behavior characteristic sequence as prediction basis is an appropriate solution.

### 2.3 The uncertainties and solution of product abandonment

Product abandonment is the main cause of reverse logistics. It is relate to using habit of consumers and life cycle of products. The quantity of product abandonment has direct relation with sales volume, inventory, operating frequency and other relevant datas. regression forecasting analyze phenomenon's trend which is relate to forecast objects base on causal relationships between economic phenomena, then calculate quantity state of forecast objects. Hence regression forecasting method can accurately

forecast the quantity of product abandonment.

**2.4 comprehensive analyses**

In conclusion, there are many factors produce uncertainties of reverse logistics, previous single forecasting method cannot adapt to the complex interference factors. So this paper uses combination forecast model to overcome the limitations of single forecasting methods and accurately predict the quantity of reverse logistics. Thereinto, the grey system GM (1, 1)<sup>[4]</sup> model predict based on historical logistics quantity, it only need a small amount of data and simple calculation. What's more, it has good adaptability with gray system such as reverse logistics. The multi-linear regression models predict based on variables related to predictor variables, it has well complementary with GM (1, 1) model.

**3 Modeling Principle of Individual Forecast**

**3.1 Grey system prediction**

GM (1, 1) is the most popular gray forecasting model, the basic steps are as follows :

Set the raw data sequence as  $x^{(0)}$ ,

$$x^{(0)} = (x^{(0)}(1), x^{(0)}(2), \dots, x^{(0)}(n)) \tag{1}$$

(1) Calculate AGO sequence by accumulation,

$$x^{(1)} = (x^{(1)}(1), x^{(1)}(2), \dots, x^{(1)}(n)), \quad x^{(1)}(1) = x^{(0)}(1); \quad x^{(1)}(k) = \sum_{m=1}^k x^{(0)}(m). \tag{2}$$

(2) set  $z^{(1)}(k)$  as the mean sequence of  $x^{(1)}$

$$z^{(1)}(k) = 0.5x^{(1)}(k) + 0.5x^{(1)}(k-1), \tag{3}$$

$$z^{(1)} = (z^{(1)}(2), z^{(1)}(3), \dots, z^{(1)}(n)), \tag{4}$$

Then the grey differential equation model of GM(1,1) is as follow,

$$x^{(0)}(k) + az^{(1)}(k) = b \tag{5}$$

(3) Construct the equation matrix as follows,

$$y_n = BP, \tag{6}$$

$$y_n = [x^{(0)}(2), x^{(0)}(3), \dots, x^{(0)}(n)]^T,$$

$$B = \begin{bmatrix} -z^{(1)}(2) & 1 \\ -z^{(1)}(3) & 1 \\ \vdots & \vdots \\ -z^{(1)}(n) & 1 \end{bmatrix}, \quad P = \begin{bmatrix} a \\ b \end{bmatrix}.$$

(4) Calculate the parameters sequence,

$$P = \begin{bmatrix} a \\ b \end{bmatrix} = (B^T B)^{-1} B^T y_N \tag{7}$$

(5) The GM(1,1) model is gained by parameters calculation,

$$\hat{x}^{(1)}(k+1) = (x^{(0)}(1) - \frac{b}{a})e^{-ak} + \frac{b}{a}, \tag{8}$$

$$\hat{x}^{(0)}(k+1) = \hat{x}^{(1)}(k+1) - \hat{x}^{(1)}(k) \tag{9}$$

**3.2 Multiple linear regression model**

Set the prediction object y is influenced by  $x_1, x_2, \dots, x_m$ , and its relationship is a linear equation as follow,

$$y = \alpha_0 + \alpha_1x_1 + \alpha_2x_2 + \dots + \alpha_mx_m + \varepsilon \tag{10}$$

If observations  $(y_i, x_{i1}, x_{i2}, \dots, x_{im})$  can be gained, then we can establish the following equation,

$$y_i = \alpha_0 + \alpha_1x_{i1} + \alpha_2x_{i2} + \dots + \alpha_mx_{im} + \varepsilon_i, \quad i = 1, 2, \dots, n, \tag{11}$$

$$\text{Set } Y = (y_1, y_2, \dots, y_n)^T, \varepsilon = (\varepsilon_1, \varepsilon_2, \dots, \varepsilon_n)^T, \alpha = (\alpha_0, \alpha_1, \dots, \alpha_m)^T,$$

$$X = \begin{bmatrix} 1 & x_{11} & x_{12} & \cdots & x_{1m} \\ 1 & x_{21} & x_{22} & \cdots & x_{2m} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & x_{n1} & x_{n2} & \cdots & x_{nm} \end{bmatrix}, \tag{12}$$

$$\text{Then, } Y = X\alpha + \varepsilon, \tag{13}$$

$\alpha$  is unknown parameters,  $Y$  is observations vector,  $X$  is Observations matrix,  $\varepsilon$  is random error vector.

#### 4 Forecast Combination Based on Forecasting Effective Measure

At present, the research of linear combination prediction model<sup>[5]</sup> is based on the criteria that minimize the sum of squared errors. In fact, this criteria and assumption can not reflect the validity of the prediction method perfect, for different index sequences have their own dimension, which can not lead to a direct comparison. Even the same index sequences with same dimension, due to different indicator values over the same period, the same amount sum of error squares can not show the prediction methods equally and effective. The prediction method in this paper use the average of prediction accuracy to reflect its dispersion degree of the mean square error description, the modeling steps are as follows.

Set the time sequence of certain index as  $\{x_t, t = 1, 2, \dots, N, N + 1, \dots, N + T\}$ , the sample interval is  $[1, N]$ , and the prediction interval is  $[N + 1, N + T]$ . If the kind of prediction method is  $m$ , and  $x_{it}$  stands for the fitted value of  $i$ -th method in time  $t$ , then its relative error is

$$e_{it} = \begin{cases} -1, (x_t - x_{it}) / x_t < -1 \\ (x_t - x_{it}) / x_t, -1 \leq (x_t - x_{it}) / x_t \leq 1 \\ 1, (x_t - x_{it}) / x_t > 1 \end{cases} \tag{14}$$

and its prediction accuracy is

$$A_{it} = \begin{cases} 1 - |e_{it}|, 0 \leq |e_{it}| \leq 1 \\ 0, |e_{it}| > 1 \end{cases}. \tag{15}$$

Set  $l_1, l_2, \dots, l_m$  as the weighting factor of individual forecasting methods in the sample interval, then the fitting accuracy of combination model in time  $t$  is,

$$A_t = 1 - |(x_t - \hat{x}_t) / x_t| = 1 - \left| \sum_{i=1}^m l_i e_{it} \right|, t = 1, 2, \dots, N. \tag{16}$$

Thus, combination prediction model on the sample interval can be expressed as the following optimization model

$$\begin{aligned} \max m_1 &= \sum_{t=1}^N Q_t A_t, \\ \text{s.t.} &\begin{cases} A_t = 1 - \left| \sum_{i=1}^m l_i e_{it} \right|, t = 1, 2, \dots, N, \\ \sum_{i=1}^m l_i = 1, l_i \geq 0, i = 1, 2, \dots, m. \end{cases} \end{aligned} \tag{17}$$

In the same way, combination prediction model on the total interval can be expressed as



$$\begin{aligned} \max m_1 &= \alpha \sum_{t=1}^N Q_t A_t + (1-\alpha) \sum_{t=N+1}^{N+T} Q_t A_t, \\ \text{s.t.} &\left\{ \begin{aligned} A_t &= 1 - \left| \sum_{i=1}^m l_i e_{it} \right|, t = 1, 2, \dots, N, N+1, \dots, N+T, \\ \sum_{i=1}^m l_i &= 1, l_i \geq 0, i = 1, 2, \dots, m. \end{aligned} \right. \end{aligned} \tag{18}$$

$0 \leq \alpha \leq 1$ , The greater  $\alpha$  means more emphasis on fitting validity, and the smaller means more emphasis on prediction validity. This model can be solved by linear programming software.

### 5 Examples

Take the prediction of China's scrapped car as the example<sup>[6]</sup>. Table.1 shows the auto production, ownership and end-of-life data of China from 2002 to 2010, production and ownership are the highest correlation with predictor variables, which are set as the foundation of multiple linear regression. (Unit: ten thousands)

**Table 1 Data of China's Auto**

Year \ Category	2002	2003	2004	2005	2006	2007	2008	2009	2010
production	325	444	509	570	728	888	938	1350	1806
ownership	2035	2383	2694	3160	3697	4358	4975	6288	7802
scrap	71	85	93	109	145	175	220	270	292

So the raw data of grey system is  $x^{(0)} = (71, 85, 93, 109, 145, 175, 220, 270, 292)$ , and the prediction equation is  $\hat{x}^{(1)}(k+1) = 396.5505e^{0.1882138k} - 325.5505$ .

Set the ownership of car is  $X_1$ , the production is  $X_2$ , and the end-of-car is  $Y$ , then multiple linear regression model can be obtained by software SPSS,  $Y = 0.1X_1 - 0.233X_2 - 56.538$ .

Weights of grey system prediction  $l_1 = 0.387$ , and weights of multiple linear predict regression is  $l_2 = 0.613$ .

The results and errors of three prediction methods are shown in following table.

**Table 2 Forecasting Results Cross-References**

Year	real value	gray system		multiple linear regression		Combination Model	
		predictive value	error value	predictive value	error value	predictive value	error value
2003	85	82.122	2.878	78.31	6.69	79.785	5.215
2004	93	99.129	-6.129	94.265	-1.265	96.174	-3.147
2005	109	119.658	-10.658	126.652	-17.625	123.945	-14.945
2006	145	144.438	0.562	143.538	1.462	143.886	1.114
2007	175	174.35	0.65	172.358	2.642	173.129	1.871
2008	220	210.456	9.544	222.408	-2.408	217.783	2.217
2009	270	254.041	15.959	257.712	12.288	256.291	13.709
2010	292	306.649	-14.649	302.864	-10.864	304.329	-12.329

From table 2, the squares error sum of grey system prediction is 720.550, while the squares error sum of multiple linear regression is 640.935, and the squares error sum of combination prediction is 610.051.

### 5 Conclusion

By practical analysis the results reveal that the accuracy of the combination forecast theory is

significantly higher than the two single forecast methods. Taking into account the uncertainties of reverse logistics, this method effectively develop features and advantages of two forecasting model, and overcome the shortage of single forecasting model. The results can be used to reverse logistics industry planning and infrastructure construction feasibility study, etc.

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# Research on Economic Development Problems of Wuhan City Circle in China from Inclusive Growth Perspective

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**Abstract:** Inclusive growth called as “shared growth”, is a kind of value orientation and a new social economy growth way. Its fundamental purpose is to let the people of all the countries and regions enjoy the achievement of economic development, realize the harmonious development of economic society in the process of sustainable development. In this paper, we present an investigation, a collection and analysis of economic data, found the problems of Wuhan city circle economic development are the regional differences among cities, cities’ development level is uneven, Wuhan alone big, illustrate the impacts by the economic problems. Based on the concept of inclusive growth, we give three main insights for making Wuhan metropolitan become mature, excellent and efficient.

**Key words:** Inclusive growth; Regional economy; Wuhan city circle economy; Development problem

## 1 Introduction

The concept of Inclusive growth was first proposed to eliminate poverty and solve the problem of uneven development in Asian developing country in 2007 by the Asian Development Bank. On November 15, 2009, Chinese president Hu Jintao made a speech entitled “Force to Deal with Challenges and Propel Sustainable Development” at the Asia-Pacific Economic Cooperation Organization. In his speech, he emphasized that human should advocate inclusive growth and give overall consideration. On September 16, 2010, Hu Jintao addressed the opening ceremony of the Fifth APEC Ministerial Meeting on human resources development, gave a statement titled “deepen exchanges and cooperation to achieve inclusive growth”, once again emphasized that realize “Inclusive Growth” and solve the social problems in economic development to lay a solid social foundation for advancing trade and investment liberalization and implementing economy long-term development, and that, the fundamental purpose of realizing inclusive growth, is to ensure economic globalization and economic growth benefit all countries and regions, benefit all the population, and realize the coordinated development of economy and society in the process of sustainable development. In the past decades, China's successful growth in economy attracted worldwide attention, but at the same time, accumulated a lot of social problems, regional economy as an epitome of national economy, also accumulated many problems. So at the process of implementing regional economic in china, explore and use “inclusive growth” in order to realize the sustainable development, and construct a new mode economic growth of harmonious society has important meaning.

## 2 Connotation of Inclusive Growth

### 2.1 The ways of realizing inclusive growth is inclusive

The meaning of “inclusive” in modern Chinese dictionary is tolerance, receiving. From social economy development perspective, “inclusive” advocates free, open and fair. Inclusive growth proposes right fairness, opportunity fairness, regular fairness and allocation fairness. Inclusive growth is not only a social and economic development that needs mankind to complete, but also a principle needs all nations to follow.

### 2.2 The ultimate goal of inclusive growth

Inclusive growth dedicates to the fulfillment of fair and reasonable sharing the fruits of economic growth, let the vulnerable groups be protected, so that all people have equal right of various aspects. Globalization closes the economic and cultural exchanges among areas; allocates kinds of resources, production elements in the global scope; enhances economic complementarities, inclusive growth is committed to the whole world economy as the situation of “you have me, I have you”.

### 2.3 The principles of inclusive growth insists

Inclusive growth adhere people-centered development to solve the basic problem of the people's livelihood, and pay attention to social stability, called for strengthening the building of small and medium-sized enterprises and fostering individual capacity in balanced economic growth process, emphasizes investment and trade liberalization, opposes trade and investment protectionism. Liu Meina

believed that “inclusive growth” is seeking the harmonious development of economy and society, implementing economic long-term and overall development. Economic interest allocation should be carried out fair and justly, make economic grows benefit to all citizens as far as possible.<sup>[4]</sup> Zhou Yangmin and others through the study of the growth of India economy think Indian conceal wealth in civilian is the concrete embodiment of “inclusive growth”.<sup>[5]</sup>

### 3 Problems of Wuhan City Circle's Economy Development

#### 3.1 Overview of Wuhan City Circle

Wuhan called as the “nine provinces thoroughfare” is an especially big city in Central China, is the financial center, traffic center and cultural center of Central China. Wuhan city circle is a city community makes Wuhan as the center, with a radius of 100 kilometers, including Wuhan and eight medium-sized city of Huangshi, Ezhou, Xiaogan, Huanggang, Xianning, Qianjiang, Xiantao, Tianmen of china. Its area is about sixty thousand square kilometers, achieves 33% of Hubei province area. Its population occupies 51.6% of Hubei general population.

#### 3.2 Wuhan city circle's economy development problem

The current economy of china is at a high-speed growth but produces various problems; coordinated development has not handled well. Wuhan city circle as a key area of the national strategic planning and implementation, the author through visit investigation and combined with relevant statistical data found that in Wuhan city circle development process, there are also many economic and social problems. Table 1 shows the main social and economic indicators of Wuhan, Huangshi, Huanggang, Ezhou, Xiaogan, Xianning up to 2010 December (The status of Qianjiang, Tianmen and Xiantao are the same as Xiaogan, Xianning, so we did not list).

**Table 1 Main Social and Economic Indicators of The Six Cities in Wuhan Urban City**

	Wuhan	Huangshi	Huanggang	Ezhou	Xiaogan	Xianning
Gross Regional Product GDP (Billion Yuan)	4559.11	352.52	96.00	395.29	155.81	132.20
Deposit Balance of Financial Institutions (Billion Yuan)	10335.17	451.26	151.07	256.64	275.71	156.00
Loan Balance of Financial Institutions (Billion Yuan)	3240.40	219.29	89.27	149.43	158.00	81.43
Total Investment in Fixed Assets (10 Thousand Yuan)	3048.51	232.61	155.76	298.64	120.39	128.50
Total Retail Sales of Social Consumer Goods(10 Thousand Yuan)	2261.99	161.03	57.10	135.05	68.31	57.73
Total Industrial Value (Billion Yuan)	2458.75	481.54	275.73	272.04	388.79	279.34
The Per Capital Public Library (Ce)	1.88	1.18	1.20	0.34	0.40	0.33
Hospital (Ge)	130	29	18	43	28	15

(Source: China Economic Information Network Database)

#### 3.2.1 Unbalanced economy development in Wuhan urban circle

Wuhan as the center and leader of Wuhan urban circle has higher economic development level than other cities. The deposits and loans in financial institutions and industrial total value index data reflect Wuhan achieved gratifying success in industry development and financial scale, but in contrast to other cities' data, as show in table one, we found that the quantity of Wuhan city is more than the sum of other city, which means that Wuhan Metropolitan has polarization effect, shows the condition of intermediate oversized and surrounding minimal.

#### 3.2.2 Discordant infrastructure construction between Wuhan and other cities

City infrastructure is to satisfy the City material production and the needs of the residents, includes energy facilities, supply and drainage facilities, transport facilities, communication facilities,

environmental protection facilities, and disaster prevention facilities. City's development is inseparable from the basic facilities. After our visit, we found that the infrastructure construction was put in very big difference between Wuhan and other cities. The Fixed Assets Investment index also reflects this point.

3.2.3 The educational, cultural, and health resources distribute unreasonably.

The level of education, culture and health is a measure of one area residents' satisfaction, also a main index to evaluate whether the region is livable or not. Hubei province has good educational resource, brings together many domestic colleges. According to the statistical yearbook of Hubei province, there are 95 universities located in Wuhan city circle, further we found there are 78 universities from table one, accounted for 82% of the entire city circle, as shown in figure 1, and according to the Ministry of Education, 7 universities are named as "211 Project" university of Hubei province are all in Wuhan. Therefore, the educational resources, excellent education resources are all concentrate in Wuhan. Come and see the quantity of hospital and public library shown in table one, the situation is the same as the quantity of university, so the distribution of Wuhan city circle in educational, cultural and health resources is extremely lopsided.

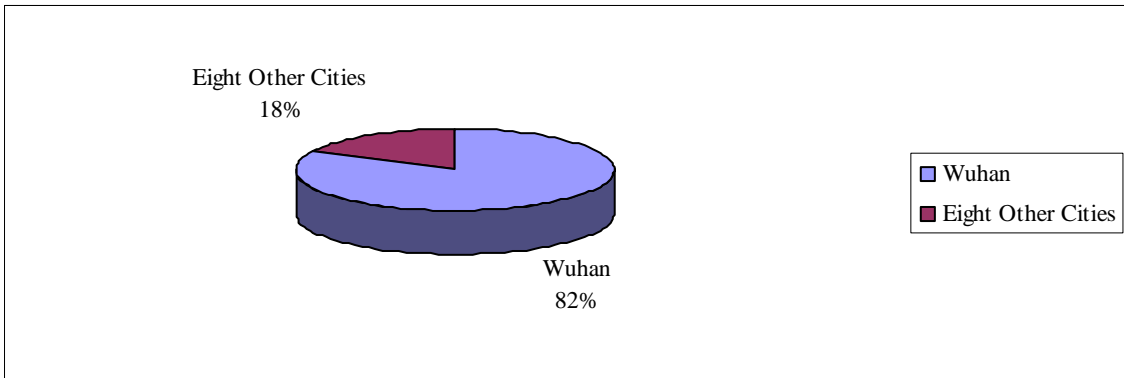


Figure 1 University Distribution within Wuhan Metropolitan Circle

3.3 The impacts of the problems exist in Wuhan city circle development

We can see from the database of China economic information network that the development of Wuhan city circle from 2001 to 2010 is just Wuhan's development, from figure 2, we can also see that eight other cities cannot get anymore before all sorts of opportunities, which causes the current development pattern that Wuhan is big along, the developments of the eight cities are lagged seriously. Imbalanced economy and the people's livelihood problem bring about serious adverse effects to Wuhan city circle.

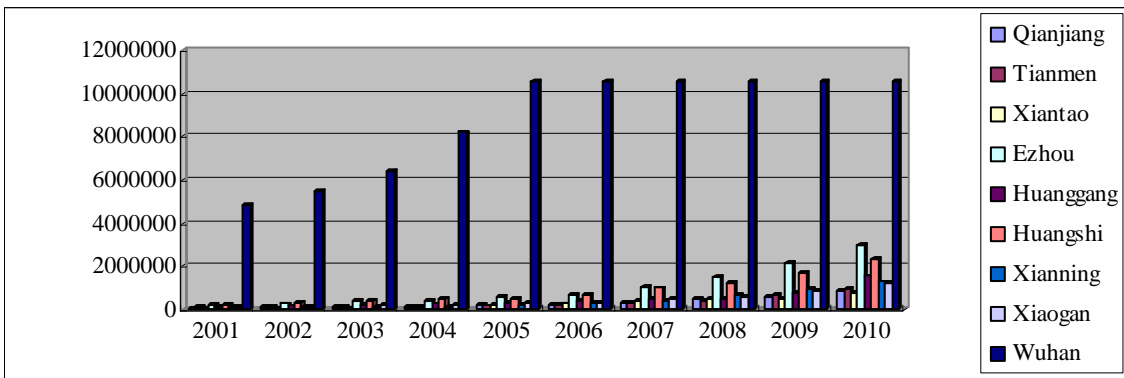


Figure 2 Regions' Total Investment in Fixed Assets

3.3.1 The polarization effect of center city is sharp

Metropolitan area as the second stage of city group makes big city as the core and surrounding small-medium cities participate the division and cooperation of labor, is a phenomenon of integral and regional economic, its reasonable scale layout should be "center city—deputy center city—small and medium city". From each city's Industry Accumulative Value and GDP index, we can see Wuhan was the center of the circle, but there was no second class city. All sorts of capital, technology, labor force

resources in Wuhan cannot get effective diffusion, forms a one-way predatory absorb of the eight cities' resources make himself cannot develop well during his growth process, we can see from figure 2, there was no change in fix assets investment of Wuhan from 2005 to 2010.

### 3.3.2 The income gap between Wuhan and other cities is dwelling

The ultimate aim of economic growth is to benefit from people's life, economic development drives the employment, and high employment rate can enhance income level. But in Wuhan city circle, Wuhan city and other eight cities' economic development differed very far, which result in income gap between the other eight city's residents and Wuhan city's residents, and lead to income structure become imbalance, increase the gap between the rich and the poor.

### 3.3.3 Wuhan city circle's integrated function was inhibited

Wuhan city circle serves as a whole of organic system, the imbalance of economic development and resource allocation coordination agglomeration effect, scale effect are not obvious within the entire metropolitan area; there was also no cost effect because of any reasonable resource integration and industry regulation. The imbalanced internal structure result in the efficiency of the whole city circle is not high and the metropolitan's brand effect has not been played.

## 4 Use Inclusive Growth to Solve Wuhan City Circle's Economy Development Problem

If Wuhan city circle want to be a mature, excellent and efficient economic community and achieve steady and rapid development, it must realize coordinated development among Wuhan, Huangshi, Ezhou, Xiaogan, Huanggang, Xianning, Qianjiang, Xiantao and Tianmen area of china. The most basic meaning of inclusive growth is fair and reasonable sharing the fruits of economic growth, and pay attention to all aspects of people's equal rights. Unreasonable resource distribution has seriously affected the development of Wuhan city circle. Solve the fair problem of the development between the cities is imminent. Inclusive growth has become an important means to realize Wuhan city circle's development.

### 4.1 Clear and perfect regional function to eliminate cities' administrative barriers

Inclusive growth encourages regular fairness. Social economic development has always been mediated by the two hands of market and government. When market regulated function is out of order, government should play a role. Up to now, the internal economy development of Wuhan metropolitan region is extremely lopsided, the whole function of the urban circle also failed, the government should give full play to its function of macroscopical adjusting control, eliminate the policy causes of regional differences. Equal administrative policies conducive to the exchanges and cooperation of regional business and personnel flow in both directions; unified market is conducive to reasonable and effective configuration of resources and elements among regions; perfect standard system is the inspection standard of all sorts of policy implementation results. Policy planning can clarify city's function position, further clarified what the city should develop, what the city should limit, what the city should forbid, and break regional barriers to achieve coordinated development.

### 4.2 Establish reasonable industry structure conducive to urban economic sustainable development

Rational industrial structure is the fundament of regional economy and can keep it developing steadily and rapidly, inclusive growth emphasizes internal coordination. To achieve reasonable industry structure of Wuhan city circle economy development, the first what we should to do is speeding up Wuhan city's industry structure upgrade, expanding tertiary industry rapidly, making cultural tourism industry, science and technology service industry as the key development industry, Wuhan should committed to "Ecological City". Second, improve the capacity of undertaking Wuhan city's industry transfer of the cities around Wuhan, through the establishment of encouraging innovation and entrepreneurship environment, economic environment, legal environment, and public opinion environment to guarantee the stable and healthy industry development. Third, through improving investment and financing platform for small and medium enterprises to encourage and support the development of small and medium-sized enterprises, so as to coordinate industrial scale of the entire area.

### 4.3 perfect city infrastructure construction of the inside circle, pay attention to people's livelihood

Mr. Sun Zhongshan once said, people's livelihood is the livelihood of the social living, is the national life, is people's life. People's livelihood is the fundamental problem that inclusive growth to solve. Wuhan city circle economic coordination development brings about dweller income gap, increased disparity between rich and poor. The first what Wuhan city circle should to do to realize harmonious is to improve the infrastructure construction level, handle people's clothing, food, housing

and travel demand, improve life happiness index; secondly, increase income level of low income area, correct income allocation proportion, by raising income level to consolidate people's happiness satisfaction; finally, cultivate and improve teachers' strength, increase educational inputs, perfect educational equipment, make children have equal access to education in various places.

## 5 Conclusion

The mission of Wuhan urban circle's construction should be to narrow regional differences, to improve the level of cities' infrastructure construction, to strength collaboration between cities, to establish cooperation framework beneficial to share economic outcomes, and solve unreasonable economy situation fundamentally. The approach of using inclusive growth to solve Wuhan city circle's incompatible development is an important way to construct social economy in the future.

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## Research on Blue Management Innovation of Pale-biotic Fossil

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**Abstract:** This paper puts forward the countermeasures for achieving the blue management innovation of pale-biotic fossil by using the research methods which approach present questions by researching ancient cases on the basis of the analysis of mass extinction events in biological evolution history, the connotation of the blue, the contents of the blue management innovation of pale-biotic fossil and the present situation and abuse of the pale-biotic fossil management; thinks the blue management innovation of pale-biotic fossil should achieve the goal of continuous increase and sustainable development of the economy, ecology and social comprehensive benefit; had reached the conclusion that “the blue idea” is natural ecological equilibrium, the harmony of human society and the harmonious development between the people and nature.

**Key words:** Blue management innovation; Pale-biotic fossil; Mass extinction events; Blue idea

### 1 Introduction

The fossils of China are rich and varied, may be rated as the first in the world. For the sake of understanding the biological evolution process some hundred millions years ago when the mankind had not appeared, the most reliable evidence is unearthed fossils in strata. These pale-biotic fossil resources have a very important scientific value and ornamental value, an important position increasingly in the research of biological evolution and human existence and development and other aspects. However, as a result of unreasonable exploitation and utilization as well as the lack of protection consciousness of the pale-biotic fossil resources, the destruction phenomenon of the pale-biotic fossil resources is very serious, and has caused the destruction of the ecosystems, the existence of the people as a member of the nature is being also menaced by a great threat<sup>[1]</sup>! For this reason, strategy research of the “blue” management innovation of pale-biotic fossils of China is particularly important

## 2 The Concept of the Pale-biotic Fossil and the Mass Extinction Events in the Evolutionary History of the Organisms

### 2.1 The concept of the pale-biotic fossil

The pale-biotic fossil (Fossil) is the remains of the living things and the traces of the life activities as well as residual organic molecules remained by the formation cause of the living things, those are preserved in the rock stratum in a geologic historic period<sup>[2]</sup>. The ancient and modern biologic circles generally take the Holocene Epoch ( that was ten thousand years ago ) as dividing line, those living things lived Holocene Epoch ago are called after Ancient organisms, but those living things lived since Holocene Epoch are a part of Living organisms.

### 2.2 The mass extinction events in the evolutionary history of the organisms

The American scholar Sepkoski had gathered statistics of various data of marine animal fossils which take the family as unit about 6 hundred million years of The Phanerozoic Era in 1982, identified 5 major extinction events (as Table 1).

**Table 1 Sepkoski (1982) Identified 5 Extinction Events**

Extinction event	Years from mow/Ma	Number of family of extinct marine animal
I Extinction in Later Ordovician Period	439-440	22
II Extinction in Later Devonian Period	360-380	21
III Extinction in Later Permian Period	220-230	50
IV Extinction in Later Triassic Period	175-190	20
V Extinction in Later Cretaceous Period	60-65	15

It can be seen from Table 1, the biotic crisis was the most serious in the Later Permian Period, and 50 families of marine animals have become extinct. In this period; they were almost half of the number



of total families of marine animal at that time. It is more serious if the genus and species as the unit are used for statistics, the genera about 83% of the total number of marine animals and the species about 96% have become extinct, only the species of 4% of the marine animal were continued to Triassic Period. Above vast majority of extinction events in the history of biological evolution was caused by external causes. At present, various animals about 1.40 ~ 1.70 million kinds are living on the earth, disappearing at the speed that a species is extinct per hour. Now many scholars believe: new extinction is an extinction of terrestrial animal groups that the most are extinct, this is caused by new predators. The mankind not only prey the animal group, but also occupy a large number of land which originally belongs to the animal habitat, the ecological competition also causes the animal extinction. Particularly the people are being on the predatory utilizing of the wild animal and plant resources because of commercial trade are important factor to cause the imminence and even extinction of the species.

### **3 The Connotation of the Blue and the Contents of the Blue Management Innovation of Pale-biotic Fossil**

#### **3.1 The connotation of the blue**

“Blue” is a natural culture, “blue” is very pure, usually let the people connect the ocean, sky, water and the universe in mind. The pure “blue” shows a beautiful, calm, rational, serene and vast. “Blue” is a symbol of eternity, means that the equilibrium of nature, the harmony of human society and the harmonious development between the people and nature, these have already become the important sign of modern human civilization. So introduce the adjective "blue" into the management innovation activity of pale-biotic fossil. “Blue” means the ecological equilibrium, the ecology is the relationship and the state of existence among the living things as well as between the living things and environment; the ecological equilibrium is a fundamental condition that the living things maintain normal growth and development, reproduction and procreation, is also the basic conditions for human existence. This paper is generally speaking only all activities to take the history of biological evolution as a guide, to blend the blue idea in the process of the protection, management, scientific research, popular science, reasonable use of the pale-biotic fossils, integrate rational utilization of the pale-biotic fossil resources and thought, action and plan of environmental protection as a whole.

#### **3.2 The contents of the blue management innovation of pale-biotic fossil**

In main research aspect to establish and perfect a comprehensive system of the protection, management, scientific research, popular science, reasonable use of the pale-biotic fossils in China, the innovation begins to be paid attention to and approached by the scholars, but it is closed by the end at present, the research on the comprehensive system of the protection, management, scientific research, popular science, reasonable use of the pale-biotic fossils has not still to be considered by the blue management innovation. This paper thinks the blue management innovation of the pale-biotic fossils has the following three kinds of representative meaning:

The first kind of the meaning: the blue management innovation of the pale-biotic fossils refers from the point of view of fully utilizing the pale-biotic fossils which are a superiority of irreplaceable resources, to take ecological equilibrium, the harmony of human society and the harmonious development between the people and nature as the foundation, to promote the change from the superiority of the resources into market superiority and economic superiority by formulating corresponding blue systems and policies on the basis of < The pale-biotic fossil protection ordinance > in the process of the protection, management, scientific research, popular science, reasonable use of the pale-biotic fossils.

The second kind of the meaning: the blue management innovation of the pale-biotic fossils refers to achieve the sustained growth of regional economic, ecological, social benefits according to the objective requirement of the development of the times and the market competition, by the integrating the resources to build the top superiority. Its essence is to reposition that the resources of the pale-biotic fossils not only need to be protected and utilized, but also need to be developed, is the inevitable choice for sustainable development.

The third kind of the meaning: the content of the blue management innovation of the pale-biotic fossils is very rich, mainly includes the innovation of the blue concept and blue culture, the innovation of talent development and encouragement, the innovation of the regulations and system, the innovation of plan and management etc., i.e. the comprehensive, systemic blue management of all activities. So that achieves the goal to improve the maximization of management efficiency and benefit, continuously strengthen the consciousness of all citizens that voluntarily protect the resources of the pale-biotic

fossils and environment. This is the essential characteristics of the blue management innovation of the pale-biotic fossils.

## **4 The Present Situation and Abuse of the Pale-biotic Fossil Management**

### **4.1 The consciousness to protect the pale-biotic fossils and geological environment is not strong**

According to the investigation, the pale-biotic fossil resources of our country are basically located in poor mountain areas, the economic development of these areas are more backward, on the one hand the government and masses of the locality have very strong desire to be lifted out of poverty and to develop the economy; on the other hand because the basic conditions of the locality are poorer, the information is not quick access, the development channels of economy are not many, thus the economic development strongly depends on the resources, the life and production of the masses maintain close link with natural resources, and then because of being driven by the interest, so illegal stealing and excavating, reselling at a profit and smuggling the fossils frequently happen. Many governments excessively construct the highway in the protection area in the name of the developing of the tourist trade, and so on and so forth. The pale-biotic fossil resources are seriously damaged, thus the specialists loudly appeal to the public: "If the departments concerned don't quickly adopt scientific and effective ways to deal with this situation, the pale-biotic fossil resources of the state will certainly sustain irretrievable serious losses in 5 to 10 years". If it goes on like this, not only the environment and resources are damaged, the existence of the animals and plants is threatened, but also the existence of the mankind as one member of natural world is greatly threatened<sup>[3]</sup>. In which, a very important factor is the consciousness of the whole nation and whole society to protect the pale-biotic fossils and geological environment is not strong, the handling of the relationship between economic development and protection of the pale-biotic fossils and geological environment is not proper.

### **4.2 Only pay attention to scientific research and do not pay attention to education of popular Science**

The policy of reform and open has been putting into effect since 1978, Chinese paleontology gradually get rid of the subordinate position of the strata and the geological services, and open a new phase that Chinese paleontological research begin to take itself as main, move toward the world. But the research of the pale-biotic fossils basically is in the category of natural science for a long time, the education of popular science of the pale-biotic fossils is not paid attention to. Because it is driven by economic interest, the developers always invest the most money into ornamental and entertainment facilities, rather than invest in the construction of related facilities with popular scientific education in both the construction of geological parks and the construction of the museums. At present, almost all the paleontological museum is arranged in accordance with the years or the sequence of the evolution, the sign only indicates the name, place of origin and age, do not relate the specimens with living environment of the specimens or with the mankind and human environment together, do not achieve goal of the education of popular science. It is more important to develop the scientific connotation and the education connotation of the pale-biotic fossil resources while it provides the ornamental and entertainment.

### **4.3 The construction of the laws has serious shortcomings**

The legislation on the protection, management and sustainable development of the pale-biotic fossils in China is not enough, this mainly shows as follows: first, the laws of high administrative levels have wide binding range, but the contents stipulated are in more general terms, have not strong operational characteristics, the laws of low administrative levels have strong operational characteristics, but the binding force is weaker, the binding range is small<sup>[3]</sup>; second, many parts of the present ways of the pale-biotic fossil management of our country are more backward than the practical development under the influence of the legislation tradition, third, there are not clauses on the compensative use in <The Management Way of the Pale-biotic Fossils>, these contents should be regulated by law form, so that ensure the environment and resources which are damaged are compensated, can achieve the economic interests of the state proprietary right; fourth, each part of the law and system is not coordinative and perfect, doesn't form the rule and system.

### **4.4. There are more problems in the administration at many levels that each does things in its own way**

In the management and enforcing the law, form a powerful political system to take the government as the leading factor, all departments including department of the land resources, public security, industrial and commercial etc. respectively put into effect corresponding policies, and each department is in charge of one's own responsibility, manages at one's own level, but the investment is thrown by

many sides. This system is taking more and more important role. Then sometimes the leaderships of many sides happen in the management, someone can manage, but someone can also not manage, and someone manages while there is the interest to it, doesn't manage while there is not the interest to it. The natural protection area of the pale-biotic fossil was established on the basis of the administrative order; it is short of the support and participation of the social masses of the locality, short of the contact with economic development of the locality, short of effective coordination in the protection and development as well as rational use of the resources of the buffer zone, the repelling and conflicting each other among the protection area, communes, the government of the locality are more than the cooperation and coordination etc<sup>[4]</sup>.

## **5 The Countermeasures for Achieving the Blue Management Innovation of Pale-Biotic Fossil**

### **5.1 The blue management sense and blue cultural innovation**

The blue management innovation of the pale-biotic fossils must set up new sense and new culture of correct blue management innovation; this is the prerequisite of the design of the blue management innovation of the pale-biotic fossils. The establishing of new mechanism is not equal to set up new sense. Only do away with old sense, can establish new sense. Only change the sense, can change the mechanism. The blue management innovation of the pale-biotic fossils must set up the sense of the ecological equilibrium as the foundation, the harmony of human society and the harmonious development between the people and nature, set up the sense of constantly creating and encouraging continuous innovation of a cultural atmosphere etc. At the same time these management senses are also the cultural core. The new thought, new sense and new culture of the people are not innate, are the result of the long-term learning, accumulating and shaping, so in order to realize continuous innovation of the sense and culture, the people only insist on continuous learning and are bold in the practice. In the new situation, the most prominent feature of the managers' action of the pale-biotic fossils is innovation, future the important conditions of the managers of the pale-biotic fossils should be the ability of the blue management innovation. The blue culture as a form of sense and spirit force will more and more become the internal dynamic power and fountainhead of the blue management innovation of the pale-biotic fossils.

### **5.2 The innovation of the development and the encouragement of the qualified personnel**

The development and the encouragement of the qualified personnel are the important condition and effective driving force of the success of the blue management innovation of the pale-biotic fossils. Facing the situation of more and more complex blue management innovation of the pale-biotic fossils, still need to develop the ranks of the qualified personnel which have reasonable structure, advanced idea, deep knowledge, and rich professional practical experiments, can bring remarkable results to the management, protection, scientific research, popular science, reasonable use of the pale-biotic fossils; can make the management of the pale-biotic fossils be more scientific. First of all, develop the qualified personnel in the development, on the basis of understanding the demand of the qualified personnel, import the qualified personnel that it is aimed at, pay attention to both the talents who have the achievement and the talents who have the development latent; not only attract the talents from other places and overseas, but also pay attention to the development and use of local talent resources. Next, encourage the qualified personnel in the development, comprehensively use varied encouragement mechanism according to the actual situation, combine the encouragement method with the purpose, change the mode of thinking, truly establish the open encouragement system to suit the characteristics of the blue management innovation of the pale-biotic fossils, the characteristics of the times and the needs of the talents, make the activity of the blue management innovation of the pale-biotic fossils have a continuous development in the complexity of the market competition.

### **5.3 The innovation of the laws, regulations and system**

The blue management innovation of the pale-biotic fossils is huge system engineering, must depend on the laws, regulations and system to standardize the whole process of the management innovation of pale-biotic fossil. After the mankind had summed up the five events of biological extinction and the experience of severe ecological crisis in biological history, had come to realize that the mankind is just one of the many species, it has its own position in the whole ecosystem, but only when it is helpful to the ecological system, will have its own value. For this reason, must abandon the traditional thought that the contemporary people take immediate interests as the center, establish the legislation spirit to respect the ecological nature, change the priority of the "economic benefits" into the

priority of the “ecological interests”. Only respect the ecological nature, adhere to the concept of blue, can achieve the sustainable development. So must have the blue transition In the formulation of laws, regulations, system and other aspects, from blue point of view, establish blue dynamic mechanism, blue operating mechanism, blue development mechanism and blue cultural mechanism etc.

#### **5.4 The management innovation of plan**

The plan is a more comprehensive long-term development plan, the whole work plan on deep thinking, considering and designing of future integral, long-term, basic problems. The protection and management of the pale-biotic fossil resources is established on the basis of a scientific and rational plan, if there is not a scientific and rational plan and design, will is difficult to put into effect effective protection and management. So the working out, examination and approval, execution and supervision of the plan must take the blue idea as the primary principle, thus it not only can make the economic benefits, but also do not damage the fossil resources, simultaneously can reflect the environmental benefit and the social benefit. At present, the guide for working out province-grade protection plan of the pale-biotic fossils in China have been approved, all parts of the country must work out the fossil protection plan of the administrative regions according to the guide. All parts of the country should work out the development blueprint of the pale-biotic fossil resources which harmonizes and unifies with the economic, social, environmental benefits; takes the pale-biotic fossil resources of the administrative regions as the foundation; keeps the unity with the plan strategy of the national economy and social development.

### **6 Conclusion**

From the above researches, come to the conclusion that “the blue idea” is natural ecological equilibrium, the harmony of human society and the harmonious development between the people and nature. At the same time, have pointed out that the blue management innovation of pale-biotic fossil is to take the blue idea as the foundation, actively reform and create the top superiority on the basis of integration of existing resources, produce and apply new conception and new sense, so that achieve maximum dynamic process to improve the management efficiency and management benefit. So the blue management innovation of pale-biotic fossil should consider the problems from the viewpoint of a system and the viewpoint of a whole, its purpose is to achieve continuous growth and sustainable development of economic, ecological, social comprehensive benefits.

This paper researches the work of the management innovation of pale-biotic fossil on the basis of “the blue idea”, but at present the research on “the blue idea” is not still insufficient, the countermeasures and the suggestions on the blue management innovation of pale-biotic fossil are still at the stage of theoretical discussion, are also not all have been tested by the practice, this makes the basic thinking of the research of this paper still be relatively weak, need to increase further the research strength of influence of “the blue idea” on the management innovation of pale-biotic fossil in future, so that provide more favorable thought support for the research of this paper.

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# On Construction of Industrial Ecological Culture

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**Abstract:** While pushing forward the rapid development of economy, “Economic Man” is increasingly ruining the relationship between Human and Nature. Due to the Economic Man’s desire for the economic profits, the ecological profit is neglected. In addition, the egoistic nature of Economic Man is in contradiction with the public nature of the ecological profits and violates the principles of sustainable development. Through elaborating the connotation of ecological culture of the industry, this paper deepens and expands the hypothesis of Economic Man, extends conception of “Economic Man” from bounded rational Economic Man to ecological rational Economic Man, and proposes measures of transformation from economic culture to ecological culture so as to motivate the whole industry to achieve the harmonious coexistence between Human and Nature as well as benign interaction between ecological recourses and economic development.

**Key words:** Ecological Culture of the Industry; Bounded Rational Economic Man; Ecological Rational Economic Man; Economic Development

## 1 Introduction

Ecological culture is the product of era. This concept as put forward under the condition that natural resources had depleted, environment had been seriously polluted, and ecological crisis had affect human survival and development. Ecological culture is the prime mover for ecological construction. This idea is manifested in the harmony among the management system, policies regulations, values, ethics, production methods and consumer behavior. It is also shown in the transformation from individual animal the economic to the collective, ecological smart people. Its core is how to influence people's values, behavior mode, make an ecological realm where harmony existed between human and heaven and create a healthy, civilized production and consumption patterns. A major feature of ecological culture is emphasis on the influence that such natural factors as nature law and ecological environment impose on human society. Ecological culture comprises of cognitive culture, institutional culture, state culture and mentality of culture<sup>[1]</sup>. Ecological culture emphasizes on the fact that human beings should develop, promote a kind of way of thinking, decision-making, way of production and way of life that is the harmonious coexistence with nature. Ecological culture is also a cultural form that surpassed previous cultural forms and is the advanced culture that pursues to exist and co-develop with harmony with natural ecosystems.

## 2 Eco-Cultural Implication of Industrial Development

Industrial development originates from the cultural type, and different cultures will form different industrial development direction. In a sense, the pursuit of economic interests depend on the value orientation, on the cultural significance, in particular, depends on people’s attitude towards nature. If people could not make cultural turn, in other words people can not change the understanding of the natural values, and then ecological crisis, brought about by the traditional industrialization could not possibly be fundamentally resolved. Therefore, the ecological crisis is not just an economic problem, but a serious philosophical question, an ethical issues and cultural issues. In other words, with the intensification of worldwide ecological crisis, people have to re-recognize the significance and value of natural ecosystems to human beings and have to reflect on the ancient philosophical proposition-relations between man and nature. The thinking of Western scholars on this issue have divided into two major parties—the shallow ecological school, and deep ecology school<sup>[2]</sup>, as shown in Table 1.

**Table 1 Different Views of Shallow Eco-school and Deep Ecology School**

	The root causes for ecological crisis	The solution ecological crisis
The shallow ecology school	Irrational economic, unreasonable legal systems, development and utilization of natural resources out of control	Ecological movement or the Green Movement under the concept of ecological protection
Deep ecology school	Anthropocentrism (people place “value” and “right” of human above the natural “value” and “rights”, the development is in accordance with the will of the people. people’s interests are achieved through conquering and controlling nature rather than realizing value of human and nature	Idea about caring for nature and the revival of the concept of ecology from value, worldview, values: complement of ecologicalization of technical innovation from the source of production to the production of the whole process

To resolve the existing serious ecological crisis today, it is necessary to make cultural shift, while the center of this cultural shift is to cultivate an ecological culture. Facing ecological crisis, people change view from the shallow ecology, deep ecology to the ecological philosophy. This process is the cultural turn on concept level, and it is a historic leap from traditional culture to the ecological culture.

### 3 Fulfillment of Shift from Limited Rational Economic Man to Eco-rational Economic Man

“Economic man” has two meanings: “Firstly, the goal of an individual’s activities is to enhance their own economic interests. Individuals can’t take into account the interests of others or the society’s of one’s own accord to benefit, unless he is beneficial from above. Secondly, under the condition of a variety of proposals, people choose one which is in their favor, according to costs and benefits”<sup>[3]</sup>, so that he could maximize his interests. Therefore, people who engaged in economic activities, have three characteristics: “self-interested”, “rational behavior”, “the pursuit of maximum of the benefits”.

Based on economic theory, in order to meet human social and economic activities as well as the ideology of “sustainable development”, we must deepen and extend the assumption of economic man, sublimate our pursuit from the material needs to the humanities needs and ecological needs. Economic behavior is based on material needs and aims to promote individual survival and development, “material needs”, reflects the “selfishness” “individual rationality”, “the maximization of individual interests” as its Code of Conduct. Its rationality is limited, that is, the “limited rational economic man” <sup>[4]</sup>. Ecologically rational economic man is based on “human needs” and “ecological needs”, aims to meet the spirit of the individual and integrate into the social relations, its main purpose is to seek the survival and development of mankind as a whole, its code of conduct is shown as “mutual benefit” and “collective rationality” “maximum of the benefits of the group”.

#### 3.1 The difference between “limited rational economic man” and “eco-rational economic man”

Economic Man’s rationality is limited, and its bounded rationality is shown in various forms in terms of environmental issues, the performance of bounded rationality and ecological rationality is different, as shown in Table 2.

**Table 2 “limited Rational Economic Man” and “Ecological Rationality of Economic Man” Comparison**

	Limited rational economic man	Ecological rationality of economic man
Understanding	There is not enough scientific understanding of the environment	Have a full understanding of the environmental issues
Motivation	Opportunity tendency	Take into account the long-term interests, the overall interests, the interests of the community
Behavior	Behavior detrimental to the environment	Consciously constrained environmentally detrimental behavior
Results	Economic growth mode at the expense of damaging the environment	Take into account economic interests and ecological interests

The difference between the two is obvious; the main reason for this distinction has two aspects:

(1) The scarcity of environmental resources and its public nature lead to the bounded rationality of “economic man”

First of all, environmental resources available for human use are scarce, not only the total amount of non-renewable resources are limited, but the regenerative capacity of the environment and self-purification capacity are limited. People are forced to live in a social environment where a variety of resources are scarce and living environment force the “economic man” to weigh the pros and cons in order to maximize their interests, they use what so-called “pre-emptive method” to use of scarce resources without limit, they don't consider the impact of own behavior on the environment, as well as the decrease of the opportunity other microscopic principal have. Secondly, the environmental resources are public resources, they are non-competitive and non-exclusive, everyone can enjoy and enjoyers do not take the initiative to pay, destroyers will not take the initiative to compensate for their damage. It is best for “Economic man” gain maximum benefit with minimum investment in order to pursue their interests. What producers care about is profit, consumer concerns about the effectiveness of personal consumption, and no one will take the initiative to care about the impact of personal conduct on public resources, “economic man” take advantage of environmental resources according to their cost-benefit decision criteria, regardless of the fairness of the choice and the willingness of society as a whole, even if the “tragedy of the commons” is formed, it also has nothing to do with him.

(2) The market failures lead to bounded rationality of “economic man”

The market possesses externality; externalization of environmental cost is an important form of market failure. “Economic man” is under the market economy, the law of value “invisible hand” has a decisive influence on their behavior. The market itself is defective, the specific example is the market can not reasonably evaluate and distribute environmental resources, thus the market price of the goods or services does not reflect or not fully reflect environmental costs, the value of environmental resources can not be reflected in the market. Polluters can use environmental resources for free and they do not need to count the environmental costs of its business activities with the result that environmental costs are not included in the price of goods and services. “Economic man” use free environmental resources as much as possible, regardless of serious pollution to the environment and tremendous damage to natural resources. Therefore, such market failures as the externality and deviation of environmental resources from of value and price are also one of the reasons that lead to “economic man” bounded rationality.

### **3.2 Ways for transition from “Bounded rationality, economic man” to ecological rational economic man**

The above analysis of reasons of economic man’s economic rationality aims to seek ways to shift to ecological rationality:

(1) The dynamic of the ecological rationality--economic man’s self-interest and interests’ tendency

Economic man’s primary characteristic is self-interest, and the pursuits of maximizing their own interests are regarded as a fundamental goal.

First of all, diversification of the interest goals for “economic man” is the basis of the change. Modern economic theory and practice proved that the pursuit of the interests for “economic man” is not just material wealth, but also include social, psychological, sensory, environmental, ecological and other non-material needs. The pursuit tends to diversify interest objects. With the improvement of economy and social civilization, as well as decrease of the proportion of material wealth in the overall goal, growth of the proportion of non material needs, many countries and regions in the world today are both the producers to reduce the environmental costs and consumers to enjoy the landscape and ecological consumption, consciously or unconsciously, as the case of their own pursuit of the interests of the target. This tendency provides people with chances to pursue ecological rationality.

Secondly, the life cycle makes it possible to transit to ecological rationality. Economic activity has continuity and sustainability. This requires the “economic man” considering the immediate and future short-term and long-term while counting interest; they could not only pursue to maximize interests. After counting and weighing, they will understand that in a foreseeable period of time, to maximize the overall interests is the goal he pursues. Considering the maximum of interest, natural life cycle and the time will be taken into account. Some time in the foreseeable future for is regarded as the integration interval of target interest. In this interval seeking for maximum just reflects the ecological rationality.

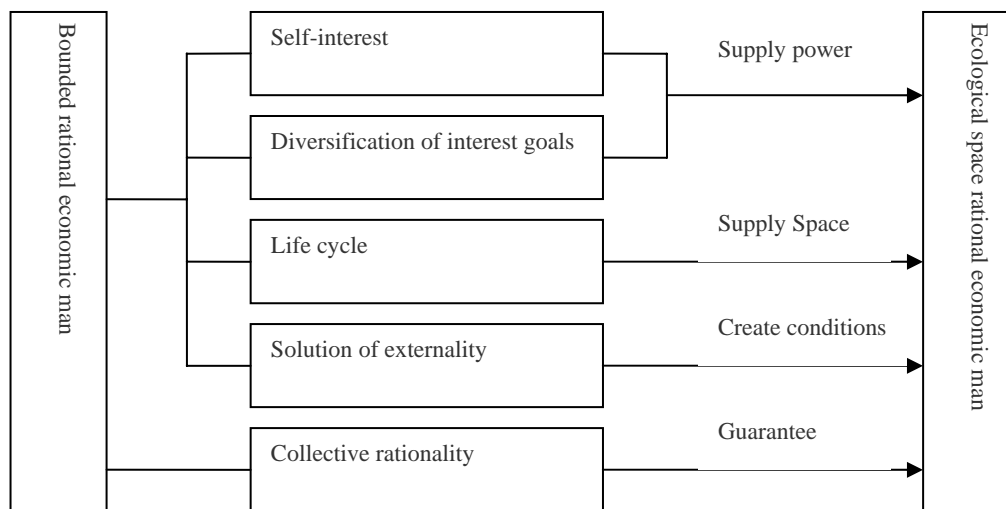
Furthermore, the solution to the problem of externalities creates the conditions for the ecological rationality. Economic activity possesses externality and the negative externality will increase the social costs, resulting in the loss of social welfare. Although these losses may not be related to each other, the socio-economic system acts as whole, producers within the region are always linked to each other in a variety of ways. Besides, they are always in a continuous, repeated game. The game will make them understand: the negative external economic issues will ultimately reduce their own interests, and then led them to find a solution to the negative externalities internalization to minimize losses and maximize the benefits. In addition, producers in the reality often are also consumers, this dual identity also contribute to the solution to external problems. For example, when cutting too much damage ecological environment, as producers they may have short-term interests, but have two losses: First, as a producer its long-term interests will be reduced. Second, as consumers they suffer health problems that environment deterioration causes. Therefore, to solve the problem of externalities is not a purely "external" pressure, but may evolve into producers’ "intrinsic" need power. Thus, the solution to the problem of externalities is the inevitable development of human society, the process to solve the problem of externalities is the process to achieve ecological rationality.

(2) Guarantee of fulfillment of the ecological rationality change—“economic man” collective rationality

Individual rationality refers to awareness and ability of some individual economic agents to pursue maximum of their own interests; collective rationality refers to consciousness and ability that the specific composition which consisted of different individuals, pursues to maximize the benefits of the collective. Collective rationality comes from the repeated game between the economic entity, people and the environment and their learning accumulation mechanisms. Maximizing the collective interests

include the following meaning: not all member who constitute collective could meet maximized interests, in other words, not to meet some of interest maximum, but to ensure that the overall interests of the collective maximize, so there is bound to sacrifice individual in exchange to maximize the overall interests. Secondly, people do not pursue to maximize short-term benefits, but to ensure maximum of the long-term benefits. This requires the development of the collective must be sustainable, short-term and long-term will be unified to seek to maximize the overall interests. Thirdly, to maximize means relying on the integration of collective power of. These also happen to be whole unified way of thinking the ecological rationality present.

The history of development of human civilization is the history where human beings gradually move toward a rational and mature in the process of repeated games between man and the nature. The experience has shown that the higher the degree of civilization of a region, the stronger the collective rationality is. Eco-environmental awareness and behavior depends largely on the collective rationality. If the concept of the collective is to enlarge the entire human race, we can say the collective rationality of human beings will be the guarantee of ecological rationality.



**Figure 1 Ways for Transition from “Bounded Rationality, Economic Man” to Ecological Rational Economic Man**

#### **4 Ways for Transition from Industrial Economic Culture to the Industrial Ecological Culture**

Industrial ecology culture is the main body of ecological civilization, and only do people cultivate an ecological consciousness and make ecological rational economic man play its role, so that the concept of sustainable development could be put into implement and to truly realize the harmonious coexistence between man and nature, ensure human’s sustained permanent development.

##### **4.1 Establishment of harmonious development on the concept level**

On concept level, the industrial ecological culture requires man to recognize the intrinsic value of nature, to abandon the concept of resisting nature, abandon the idea of man dominating nature, establish values of harmonious development between man and nature, promote the ethical spirit of harmonious coexistence with nature, in order to man and nature's common prosperity.

“Economic man” has only social attributes, without biological properties. As his life cycle is limited, rational limited, he can not correctly understand the ecological consequences of economic behavior and does not predict the long-term macroscopic impact of his behavior, thus caused many environmental problems and ecological disaster. “Ecologically rational economic man” is in pursuit of harmony between man and nature, confirms the intrinsic value of the environment and ecology which reflects in the “economic man” conscious behavior. Therefore, in order to impair “ecological rationality” to “economic man”, we should make up for the economic man’s lack of humanity, so that the “economic man” has become a complete human, in this way within limited life cycle, he can escape from the present limitations of interests, local interests, personal interests, their own profit-driven behavior will



be limited to ensure human living environment not be polluted and destructed and people form environmental protection preferences. Only with the “eco-rational economic man” self-awareness, people can transcend the purely narrow view and consciously unify the economic perspective and ecological perspective.

#### **4.2 Increase of intensity of technological innovation on the material aspect**

On the material aspect, mankind will be required to abandon the old natural modes of production and way of life-plundering life, learning the wisdom of nature, to create new forms of technology and new forms of energy, guarantee and co-existed with nature

When dealing with resources, we would prefer say “our ability is limited” rather than call “scarcity of resources”, or resources are “scarce” only in terms of human low utilization efficiency. Therefore, to completely solve the so-called “scarcity”, while practicing strict economy, we should pay full attention to the importance of technological innovation and make great efforts to cultivate the capacity for independent innovation. Whatever resource uses reduction, or product reuse and recycling, the prerequisite and basis is continuous technical progress and change. It can be said that technological innovation is key to transit from the bounded rationality to fully rational change. Technological innovation is not only the guarantee to maintain the industry's own market competitiveness, but also a prerequisite of construction of resource-saving and environment-friendly society.

#### **4.3 On system level settlement of ecological problems safeguarded by system**

On system level people are required to reform and improve the social system and social norms, changing the traditional society which can not consciously protect the environment but damage the environment spontaneously. In accordance with the principle of justice and equality, people establish the new human social community, as well as partner community between man and nature, so that environmental protection institutionalized and legalized. Much importance has been attached to long term micro development of economic society. Under this premise, people strive to solve ecological and environmental problems that may arise in the process of making social development strategies and canceling risk in the initiative stage..

#### **4.4 Advocating of green economy and green consumption on practical level**

Traditional industrial culture is “advocating high consumption, pursuing material comforts”. The value orientation of industrial ecology culture is “thrifty, the pursuit to create”. The green economy emphasizes the people-oriented value and follows the laws of nature to maintain the green environment. It also develops green industries to create industrial chain where resources, environment and products are regenerating, recycling and circulating to fulfill coordination and harmonization of man and nature, economy and society. Green economy can not only promote the social and economic development, but also can improve people’s living standards. The green consumption is asking people to abandon the current way of life and way of production, and change people’s blind obedience to the excessive consumption. It is a new environment-friendly consumption culture and consumption concept. It is win for both economic development and environmental protection and advocates moderate consumption-that is to make use of natural resources, and does not exceed the carrying capacity of ecological environment, especially basic human needs as the standard, opposed to the luxury consumption, do not go beyond their own ‘economic capacity’. Therefore, the green consumer is not only an economical consumption, consumption of common prosperity, also a civilized scientific consumption. Green consumption requires people’s consumption of non-polluting, healthy products, and consumption behavior should save energy, protect the ecological environment.

Ecological rational economic man should have ecological thinking. They should promote economic development through the industrial ecologicalization and environmental awareness, and promote the development of “green industry” and cultivation of “green market”, and ultimately make positive interaction between ecological resources and economic development.

## **5 Conclusion**

Culture of industrial ecology is a social and cultural phenomenon, it is a reflection on one’s own natural values, a transitional culture to an ecological civilization and social culture, an important part of the construction of ecological civilization, it is an advanced culture which promotes the ecological civilization advanced culture, and the cultural foundation for the construction of ecological civilization. Protection of ecological balance, just between man and nature is the lowest critical point of the relationship, the recovery and revival of the ecological balance is the highest state of relationship between man and nature. Therefore, how to create the ecological and cultural industry is indispensable

to fulfill the harmony between man and nature, make benign interaction between ecological resources and economic development and build a harmonious society.

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## Research on the Coordinating Mechanism of Technology Sharing Among Green Building Supply Chain Node Enterprises

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**Abstract:** Based on green supply chain management theory, this paper constructs a concept model of green building supply chain system. Through the analysis of technology diffusion path of the green building supply chain node enterprises, we explored technology diffusion mechanism of a green building supply chain, and analyzed the strategy choice of a green building supply chain technology diffusion in the node enterprise through the symbiotic Game model. In the end, the suggestions of establishing a green building supply chain technology sharing coordination mechanisms was put forward.

**Keywords:** Green building supply chain; Node enterprise; Technology sharing; Coordination mechanism; Game theory

### 1 Introduction

Circular economy and sustainable development is the subject of our current social activities. Green building become an inevitable trend in the construction industry for its low energy consumption, low resource consumption, environmental health and harmony with nature, etc. As a green product, Green building involves the government, developers, contractors, suppliers and consumers during the whole process from design, construction, use and management to the recycling use. Moreover, the green building has obvious externalities due to the additional environmental protection and resource saving property. Therefore, the green building development and use is not a separate subject's behavior, but to all the enterprises from production to consumption chain. How to coordinate the enterprises relationship, improve the production efficiency, which makes the research of cooperation between the member mechanism becomes a basic problem to resolve, it is why this essay focus on the green building developers as the members of supply chain cooperation mechanism. At present, foreign research of partners coordination mechanism mainly focuses on the cooperation between enterprises of the game mechanism and trust mechanism, as well as the support from top management and influence on the cooperation and coordination from cultural integration. and emphasizes on the advanced facilities use for information sharing to improve communication and cooperation. Huang<sup>[1]</sup>from the Adelphi University in US studied three kinds of relationship between vendors and manufacturers based on non cooperative game, cooperative game and Nash negotiation, and put it in application of product publicity business. Robert B, Handfield<sup>[2]</sup> think that in order to reduce supply chain entity cycle time, they should establish cooperation mode based on trust, and proposed the corresponding cooperation model. Research shows that through mutual trust can improve supply chain responsiveness.

The research focuses on the importance of the supply chain coordination in china, based on the game mechanism or the principal-agent theory of the supply chain coordination mechanism and so on, particularly emphasis on supply chain coordination of the distribution of interests. Li Fangyun ,etc<sup>[3]</sup> in her article "based on coordination center of agile supply chain system the research", which mentioned supply chain management and operation way can make use of information economics theory and methods, such as defining trading strategy and rules, makes all members honor commitment, set up under asymmetric information coordination mechanism, etc.Chen Juhong,etc<sup>[4]</sup> design the incentive and coordination mechanism of industry production, supply and marketing of three departments share interests by using the game theory.

### 2 Frame Analysis of the Green Building Supply Chain Systems

#### 2.1 Green building enterprises in supply chain

Through synthesizing Chinese and overseas scholars point of views, we believe that Green Supply Chain is under the guidance of sustainable development Theory, Supply chain management technology, Involving suppliers, manufacturers, distributors, retailers, logistics providers and other enterprises and end users, The goal is to make the enterprise from raw materials procurement, manufacturing,

distribution, transportation, storage, consumption, recycling throughout the supply chain management process to achieve economic development, environmental protection, resource conservation unified chain of the triple objectives. Therefore, the green supply chain is a chain of suppliers, manufacturers, distributors, retailers, logistics providers, consumers and recyclers, suppliers, manufacturers, distributors, retailers, logistics providers, consumers and recyclers can be called different nodes of the green supply chain.

(1)Green suppliers, Refers to the downstream node enterprise to provide green materials and green energy enterprise, The main factors to consider in selecting a supplier are: product quality, price, delivery, volume flexibility, species diversity and environmental friendliness, etc. Positive green suppliers focus on the environment, raise the level to meet the delivery requirements of green, the purpose is to reduce material usage, reduce waste production.

(2)Green manufacturers,Refers to the use of green technology, green production, green manufacturing in the manufacturing process. In the production process, manufacturers need to consider the parts of the manufacturing process input, output and resource consumption and environmental impact of material flow from raw material to the qualified parts of the transformation process and transformation processes, material and energy resource consumption, waster generation, the environmental impact of the situation.

(3)Green distributors, retailers, logistics providers, Refers to the enterprises on the sale of part of an ecological management and sale of the business, through the distribution channel for green products. Selection of brokers, they should pay attention to examine its green image, IT Can be carried out online sales, e-commerce is very environmentally friendly and broad development prospects, Promotions, green distributors on the one hand can choose the most economic and environmental benefits of the way, on the other hand we should vigorously promote the green characteristics of the enterprises and products.

(4)Green Consumer, Means required to buy health green products and services, and as far as possible in the course of environmental protection, resource conservation.With the voices of environmental protection and resource conservation has become increasingly higher and higher, green consumers pay more attention to the use of green products, and certain pressure to the upstream enterprises, also for the downstream business of waste recycling.

(5)Green recyclers, Means recycling waste products, and then processed products back to the upstream node enterprises. Recycling of products through the collection of reusable components, it is divided into the direct reuse of parts and repair, refurbishing, remanufacturing, parts cannibalization and recycling of materials to produce a variety of recycled products. Renewable parts, the parts themselves completely scrapped, but the material is renewable after use. IT Can be the transport of waste products to recycling processing plant processing, and finally the transport of recycled products to the sales site to sell.

As the green supply chain is the Commonwealth of more than one enterprise, its between enterprises of many property, only the dynamic relations of cooperation. Therefore, each enterprise in the supply chain starting from their own interests to make cooperation countermeasures.In fact, the relationship between each enterprise is actually in the green supply chain is a principal-agent relationship, its living in the mutual relationship between information superiority and disadvantage participants.

## **2.2 Concept model of green building supply chain system**

Because the participation of the main body of the green building supply chain is broader compared to the construction supply chain, its includes not only members of the construction supply chain, and the regulation of the ecological environment system, government and international organizations, supply chain operations in which the culture and value system and other factors.Therefore, from this perspective, we can divide green building supply chain into four subsystems:Production systems, consumption systems, environmental and social systems, Construction supply chain emphasis on the production system,the other three subsystems is relatively weak .Among them, production systems including the development to completion of the construction of the whole process from raw material; consumer systems including consumer the process of final consumption; environmental systems, including resource and energy inputs, recycling and waste recycling; social systems from government regulation, supervision of social, cultural and ethical factors such as guidance, motivation, constraints compatible with the natural environment in order to promote the activities of the actors. Therefore, we can use the above description of the establishment to make a more comprehensive system of green

building supply chain conceptual model Shown in Figure 1:

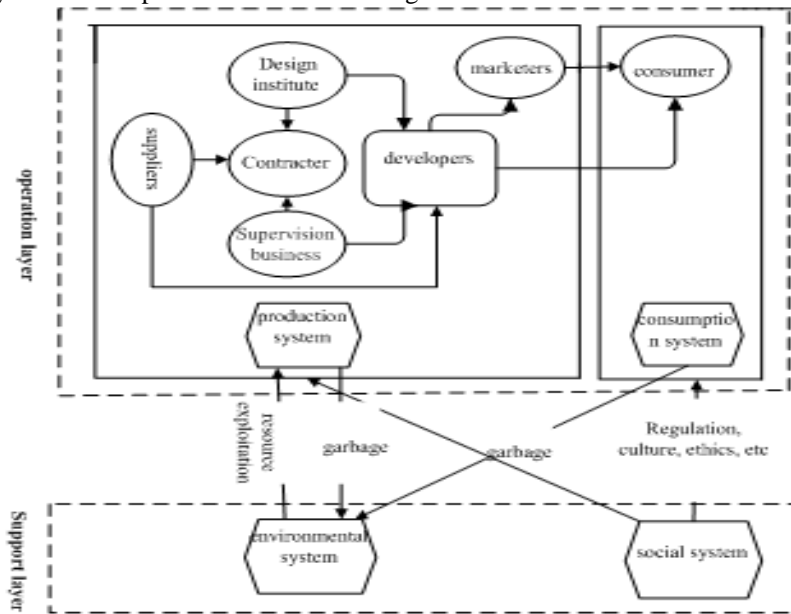


Figure 1 Concept Model of Green Building Supply Chain System

### 3 Green Building Supply Chain of Technology Diffusion Mechanism

Green building technology diffusion mechanism can be illustrated from the material flow and information flow two aspects :First of all, the green building, as a special kind of material goods, the upstream suppliers transfer green building materials and equipment to construction enterprise or real estate developers, build the green products;And the downstream enterprises through research and development and clean building activities to promote green technology development and application of upstream suppliers, it's the performance of adverse movement of information flow.The real estate development enterprise or the total package enterprise which in the core of green building supply chain tend to reduce cost and specialized business because of the strategic planning, these enterprise spread their green building techniques paid or unpaid to upstream suppliers, make its supply of raw materials into the green building department product, construction standardization system.In addition,by the supplier building materials equipment, the builders and developers to build,property service is responsible for operation and management on construction products with eventually material form to the consumers, this is the expression of material flow form.Technology diffusion path of green building supply chain as shown in Figure 2 shows:

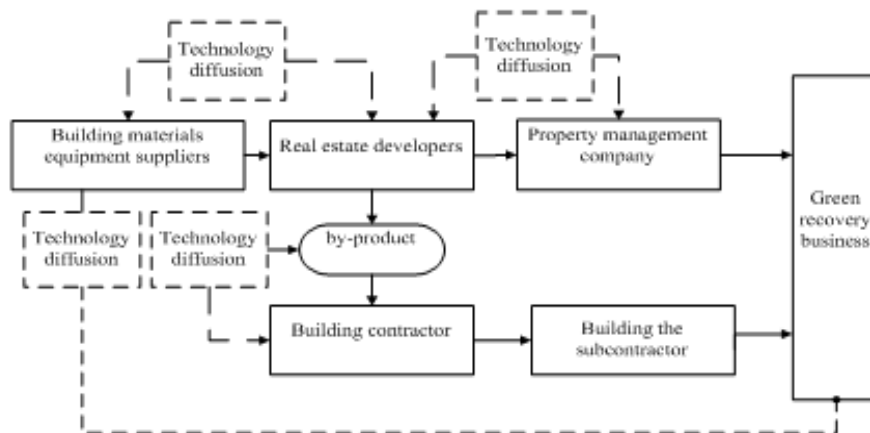


Figure 2 Technology Diffusion Path of Green Building Supply Chain

Whether in low carbon technology of architecture and material development, or energy saving and low carbon innovation in the architectural decoration industry, highlights the form with real estate as the

core of green building supply chain, in the exploration of the supply chain integration mode on the green building products, not only to realize the idea mentality of the set, but also to realize the implementation of the rational division of labor. In the front, promote "green volume rate" research, and improve the efficiency in the use of land resources; In the medium, strengthen the new systems, new products, new methods of the development, improve the content of science and technology to build; In the end, enhance the service management, improve "green added value". All these need upstream and downstream enterprises cooperation in technological development, forming a cycle closed technology development path.

#### 4 Co-existence Game Analysis of the Green Building Supply Chain Technology Diffusion

The fundamental difference of the green building technology diffusion and the general building technology diffusion that is the node enterprise mainly displays a "co-existence game", not "competitive game" in the green building supply chain formation and green building technology diffusion process, only the Node enterprises have known surely to increase the enterprise earnings by using the green materials, equipment and construction technology, can it apply positively, or to refuse or to slack. Besides the enterprise's own relative interests, the usage effect of the green building technology diffusion still depends on the green regulations degree of perfection and supervision and the mutual supervision of the internal enterprise among supply chain members. in order to state the green building supply chain members attitude towards the green building techniques, the author use the static game mixed strategy Nash equilibrium to further explain.

##### 4.1 Mixed strategies and mixed strategies Nash equilibrium

Mixed Strategies that is a random selection decision way, a game party though a certain probability distribution to choose in optional Strategies, it is of great significance for no Nash equilibrium game and multiple Nash equilibrium. If there was indeed a strict mixed strategies combinations (i.e. not degenerate into pure strategy combinations) constitutes a Nash equilibrium, it is known as "mixed strategy Nash equilibrium", at this time the Nash equilibrium means that any single party game change their strategy or randomly select each pure strategy of probability distribution can't increase oneself income. Here is a strict definition of the mixed strategies<sup>[5]</sup>:

In the game  $G = \{S_1, \dots, S_n; u_1, \dots, u_n\}$ , the game party  $i$  strategy space is  $S_i = \{S_{i1}, \dots, S_{ik}\}$  the game party  $i$  with probability distribution  $p_i = \{p_{i1}, \dots, p_{ik}\}$  choose "strategy" in the random  $k$  optional strategies, called a "mixed strategies", all  $j = 1, \dots, k$  was established among  $0 \leq p_{ik} \leq 1$ , and  $p_{i1} + \dots + p_{ik} = 1$ .

##### 4.2 Constructing model

Assuming that the node enterprises of the green building supply chain are opportunist, that is the choice of strategies space: taking a completely green technology will greatly increase the cost burden; not using green technology completely will lose other supply chain members cooperation relationship, and punished by the risk, therefore, the node enterprises will decide to the degree of green technologies engagement according to the factors of green supply chain cost and the enforcement of the supply chain to green.

Model variable description:

$p_1$  indicates the regulatory probability that other supply chain members supervise the node enterprise to implement green management behavior

$p_2$  indicates the probability of the node enterprises adopt green technology or the degree of the will.

$I$  indicates the costs of the node enterprises exploit green technology or introduce green imitation. Because this investment has the positive externality, which can bring overall efficiency for the others among the whole chain enterprise, show multiplier amplification effect that  $\omega$  said for here.

$K$  said the supervision cost of green supply chain.

$\beta$  said the supervision and punishment probability under the condition of node enterprise of green building in losses from the supply chain was found in certain supervision mechanism and technical feasibility.

$d$  said the losses of the whole green building supply chain is not green product or service for

lacking of regulation.

$f$  said the fines of the node enterprises for the green behavior pay for supply chain.

$R$  said the income that the node enterprises use green technology to achieve.

The model and its profit of the node enterprises adopt green technology and other supply chain partners take supervision and Mixed strategy Nash equilibrium, the matrix in figure 3 shows:

		<b>Goal node enterprise</b>	
		Use green technology $p_2$	Don't use green technology $1 - p_2$
<b>Other enterprise members</b>	Take supervision $p_1$	$\omega I - K, R - I$	$\beta f - K, -\beta f$
	Don't take supervision $1 - p_1$	$\omega I, R - I$	$-d, f$

**Figure 3 Green Building Supply Chain Technology Adoption and Supervision in the Game of Matrix**

**4.3 Model solution and mixed strategy**

The game party shall follow two principles in the mixed strategy game:

Principle 1: can't let your rival know or guessed your choice, so we must use randomness to make decision;

Principle 2: the probability of choosing each strategy must make the rival lock out Detroit exactly, that is, let the other side can't get the upper hand by the specific tendency of a strategy in games.

In this example, the will degree of the goal node enterprise by the green technology will depends on the effect of the mixed strategy, when the other members supervision makes the enterprise to choose the supervision expected revenue and choose not to supervision of the expected yields are equal, it reached the desired effect of the mixed strategy, we can get the following relations:

$$p_2(\omega I - K) + (1 - p_2)(\beta f - K) = p_2\omega I + (1 - p_2)(-d) \tag{1}$$

Solution:

$$p_2 = 1 - \frac{K}{d - \beta f} \tag{2}$$

Formula (2) is mixed strategy that the target enterprise use the green technology. It indicates that strategy selection is influenced mainly the supervision factors of the other supply chain members , including other enterprise supervision cost  $K$ , no supervision of technology spillovers caused loss  $d$ , specific regulatory mechanism and supervision efficiency under a specific technology conditions .When regulatory costs  $K$  is bigger, it will set aside larger space for speculative behavior of the goal node enterprise rejected the green technology, it lead to weaken the greening will; Conversely, when  $K$  is smaller, which will promote the node enterprises to research and develop green technology. Proportional relationship indicates the supply chain internal is facing with the pressure of competition that is from external other green building supply chain, in this case, the supply chain must take more supervision to the goal node enterprise. In addition, the regulation efficiency will promote the node enterprise use green technology will.

**5 Suggestions on Establishing Green Building Supply Chain Technology Sharing and Coordination Mechanisms**

(1) In green building technology diffusion mechanism, the mechanism between technology transfer and transferee is mainly the interest coordination mechanism of symbiotic game, which is clearly distinguished from the competition game relationship shown in other types of technology transfer. The path of implementing green product or technology innovation for any enterprise in the supply chain is mainly as follows: transaction contagion and competition imitation induced by market activities, green building technology induce related vertical or horizontal supply chain enterprises to absorb or R & D. This requires that member companies recognize that they must work together with partners, independent on each other, actively spread green technology and enhance the green added value of the whole supply

chain in today's market environment of the supply chain competition.

(2) The spread of green building technology belongs to voluntary corporate action under the guidance of the market. Because of its characteristics of public sector and positive externalities, this can effectively promote green construction and industrial ecology links in the enterprise communities. Therefore, enterprise members should take full advantage of the positive externalities brought by technology diffusion in order to enhance own operational efficiency and green brand image.

(3) As a developing country, the social awareness of environmental protection, public green consumer behavior and corporate clean production is still in its infancy in China. The various links that supply chain enterprises spread the green technology to the chain do help to enhance the green building requirements of the external environment. The development and adoption of green technology for enterprise members are mainly affected by the supervision efficiency and punishment strength. It can improve the credit worthiness of the entire supply chain through mutual supervision between each other. Besides, the enterprise green technology investment efforts will be more strengthened. So it is necessary to note the supervisory role between enterprise members.

## 6 Conclusion

The green building supply chain is related to the node enterprises' interests of suppliers, manufacturers, distributors, retailers, logistics providers, consumers, recyclers and so on. Compared with general building, the relationship in the green building supply chain is mainly symbiotic game rather than competition game. Its connotation is broader. In addition to focusing on the production system, it is more committed to the harmonization of consumer systems, social systems and environmental systems. For node enterprises which have technical intersections, whether they can promote the spread and sharing of technology depends on the supervision efficiency and punishment strength of the entire supply chain. Therefore, only by establishing the effective green building supply chain technology sharing and coordination mechanisms and coordinating the relationship between supply chain members can it promote the development of green building.

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# Research on Countermeasures to Improve China's Renewable Energy Management

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**Abstract:** China has proclaimed the law of renewable energy resource for about 7 years, but there are too many problems. All these problems need to be generalized and summarized. The paper brings up countermeasure system, applying questionnaire about satisfactions. It also brings up main problems about the application and management of renewable energy in China by designing questionnaire and exerting statistician and analysis. Figuring out all these problems are very important in management of renewable energy, the paper makes up system about countermeasures of management, educating Some directions about countermeasures of renewable energy management, such as the core technology development and standards, planning and design, manufacturer, usage by land agent (purchased by customers), charge collection to the users, operation management, monitoring and assessment, feedback and policy adjustment, personnel training, government function, industry association, international cooperation, financial instruments and tax preference. At last, we can get the conclusion that the countermeasures of china's renewable energy management must be done, at the same time the paper gives some advices about how to improve the management about renewable energy of China.

**Key words:** Renewable energy; Management; Improvement; Statistical analysis

## 1 Introduction

China has a plenty of renewable energy resource. With the rapid economic growth, our country proclaimed the law of renewable energy. But there are too many problems in the application work of the renewable energy<sup>[1]</sup>.

Major Western countries for the utilization of renewable energy is very seriously, among the major countries from the Western point of view, the basic use of renewable energy sources account for the total energy consumption of more than 10%. On this basis, the United States, Europe, Japan, Brazil, India and other countries are going in the use of renewable energy development in the forefront of their economies, they have established a clear share of renewable energy targets, implementation of laws and administrative compulsory measures development and implementation of preferential policies and incentives to establish a relatively complete industrial service management system.

From the research provided by the policy of Western countries, it seems that Western developed countries in the application of renewable energy has a very significant policy bias, and all policies are conducive to the use of renewable energy, industrial development, in order to accelerate the development of related industries, they are by political, legal, fiscal, financial, administrative, technical development, information, education and training aspects of an integrated role in development and utilization of renewable energy to provide a very valuable experience<sup>[2]</sup>.

The paper wants to give some countermeasures through the research of renewable energy problems. In order to know the fact, The paper designing questionnaire of satisfaction to the model. The model are deputation of the renewable field. Generalizing and summarizing the problem of the management of renewable energy. The paper analysis the scores of the satisfactions about questionnaires, using mathematics model to analyze the main idea about how to improve the management of renewable energy, it is very important to this paper.

In order to improve the management of renewable energy, we design the questionnaire. All the questionnaires concern of the application and management about the renewable energy, and they all come from government, consultation and industry.<sup>[3]-[8]</sup>

Through the questionnaire, we hope to realize the actuality of the application and management of the renewable energy, and let us to think about the problems. At last some directions about how to improve the problems are given in this paper.

This questionnaire is about solar energy, geothermal energy and wind energy. The survey is primarily focusing on the following questions:

- 1) Renewable energy resources and social needs of the investigation;
- 2) The design to improve regional planning of the renewable energy;

- 3) The core system technology of the renewable energy;
- 4) The development of manufacturers of the renewable energy;
- 5) The investment conditions of the application of renewable energy;
- 6) The fee about the using of renewable energy and social operation management;
- 7) Operation and maintenance of the renewable energy system;
- 8) Renewable energy system operation monitoring and evaluation of energy efficiency;
- 9) Personnel training of renewable energy;
- 10) The government functions of the renewable energy;
- 11) The development of industry association about the renewable energy;
- 12) National standards and local standards of the renewable energy;
- 13) International technical cooperation of the renewable energy;
- 14) Financial tools and tax policy of the renewable energy applications.

Questionnaire is in two parts, first choice, each choice question designed three different items, you can survey according to different situations in which you choose. Followed by appropriate satisfaction surveys, the choices of items for the selected design are “very dissatisfied, dissatisfied, generally, satisfied, very pleased” which are the five satisfaction rate range. Survey of the situation can be for one's own position to rate their satisfaction. Each degree of satisfaction is out of 10. Finally, the survey's scoring for statistical analysis is gotten.

**Table 1 Application of Renewable Energy Design of the Questionnaire Survey**

Survey object	Estimated number
Equipment company	30
System integration	15
Design and consultation	15
Government agency	5
Industry association	5
Real estate developer	5
Total	75

## 2 Samples and Tools for Search

In accordance with the unified arrangement of the questionnaire, a total of 75 questionnaires issued were returned 60 questionnaires, 80% recovery rate. The specific recovery is as follows:

**Table 2 Questionnaires Return Percent**

No.	Survey object	Ratio and proportion	Collection numbers	Recovery	Sample rate
1	Products	35 (46.7%)	29	83%	48.3%
2	System integration	10 (14.3%)	8	80%	13%
3	Consultation and design	15 (20%)	12	80%	20%
4	Government agency	5 (6.7%)	4	80%	6.7%
5	Industry association	5 (6.7%)	3	60%	5%
6	Real estate	5 (6.6%)	4	80%	7%
7	Total	75 (100%)	60	80%	100%

From the questionnaire obtained, it can be seen that according to the pre-set value of enterprise adjustment table, the basic business reached a predetermined nature of the questionnaire for proportion. The survey questionnaires were collected for the entire sample. In a survey of 60 samples, the statistical data and analysis the survey sample table in Appendix -1 table.

Through these investigation and study, setting up data analysis method, in this questionnaire survey, the main analytical tool is taken as follows:

Method 1: company with the same nature items, the percentage options selected.

Through this ratio to understand the company with the same nature's thinking about perspective view and focus.

Method 2: company with different type items, the percentage options selected

The selected key areas of choice with different types of enterprises, which we can understand judge the entire industry.

Method 3: the percentage of items about the whole survey company's choice selected

The view is taken by the different enterprises within the industry about the management approach, nowadays.

Method 4: the percentage options selected by the company with the same character in the same satisfaction scores questionnaire

If the companies have the same satisfaction of the view, it means that the whole companies have some general conclusions on the phenomenon.

Method 5: different types of enterprises in selected key areas of satisfaction percentage choice

Different types of enterprises in satisfaction level, they are same or different.

Method 6: the percentage scores of the Satisfaction key about the whole investigation, the choice of key aspects of business.

Appendix table 2 is provided there, it is about all the survey records into the study sample. Data is the basis for discussions of this paper.

### 3 Statistics Analysis

This part concluded the survey questionnaire and the components of the comments are summarized, specifically through statistical analysis of the current status of renewable energy, derived from different survey and analyzed the statistical results.

Through Appendix table 1-2, data must be done to the statistics. Calculation method of weighted average adopted, through these method, the paper give the average percentage scores about satisfaction .weighted average formula is:

$$X_1 = (x_1f_1 + x_2f_2 + \dots + x_kf_k) / n,$$

$$\text{Set } f_1 + f_2 + \dots + f_k = n,$$

$f_1, f_2, \dots, f_k$ ----- weights,

$X_1$  ----- average satisfaction scores,

$x_1, x_2, x_3 \dots \dots x_k$ -----satisfaction scores

According to the survey data from samples analyzed, the analysis of the questionnaire is as follows.

### 4 Data Analysis and Statistics

**Table 3 Survey Results**

No.	No Problem	The results
1	Made whether the project area carried out a census of renewable resources	80% of the sample that the lack of data, the state parties have not formed the basis of effective management
2	It has a clear regional renewable energy planning, within the region where you can clear the use of renewable energy	80% of the sample that the lack of planning for renewable energy
3	Renewable energy applications to support financial and tax policy	Sample of more than 80% think the Government for the application of renewable energy, lack of financial and tax support.
4	Renewable energy, personnel training	70% of samples that lack the relevant training of personnel
5	Are there high-quality production of renewable energy companies	Sample of SMEs in China more than 75% think that more foreign enterprises to enter the rapidly capture the market
6	Whether domestic solar and geothermal local standards and national standards	More than 85% of the sample countries and the manufacturers that are part of the standard, but not very healthy
7	The use of renewable energy equipment operating charge management	More than 95% of the sample that did not explicitly state charges, but the light of other executive

8	Operation and Maintenance issues	More than 89% of the sample that renewable energy equipment operation and maintenance of existing management problems, lack of management support for the country
9	System Operation Monitoring and Evaluation of Energy Efficiency	85% of the sample testing device that is useless to run the country without the development of related management measures and means
10	Renewable energy government functions	Sample of more than 81% of general laws that state a strong operational differences, the procedure is cumbersome, does not have a dedicated department.
11	Association issues	80% of the samples that trade associations do not play a relevant role.
12	International cooperation in renewable energy issues	70% of the sample that international cooperation is not enough
13	Domestic projects done using solar and geothermal technology is a core technology	60% of the sample countries have the core technology that is not enough
14	Community investment in renewable energy applications attitude	90% of the sample that the state subsidy policy difficult to implement. Such as the willingness to implement the use of renewable energy

**Table 4 Satisfaction Survey Results**

No.	No Problem	Select answer	Satisfaction results (Out of 600)
1	Made whether the project area carried out a census of renewable resources	A	84
		B	137.8
		C	9.5
2	It has a clear regional renewable energy planning, within the region where you can clear the use of renewable energy	A	56
		B	151
		C	7.56
3	Renewable energy applications to support financial and tax policy	A	74
		B	85
		C	34
4	Renewable energy, personnel training	A	38
		B	186
		C	12.3
5	If there are high-quality production of renewable energy companies	A	69.9
		B	164.3
		C	6
6	Whether domestic solar and geothermal local standards and national standards	A	37
		B	205.4
		C	3.55
7	The use of renewable energy equipment operating charge management	A	11
		B	176.1
		C	21.2
8	Operation and Maintenance issues	A	29
		B	132.7
		C	37.5

9	System Operation Monitoring and Evaluation of Energy Efficiency	A	40
		B	140.1
		C	22.55
10	Renewable energy government functions	A	66
		B	84.6
		C	52
11	Association issues	A	70.8
		B	97.6
		C	34.7
12	International cooperation in renewable energy issues	A	95
		B	96.4
		C	8.8
13	Domestic projects done using solar and geothermal technology is a core technology	A	124.1
		B	82
		C	8.55
14	Community investment in renewable energy applications attitude	A	32
		B	106.2
		C	40.25

## 5 Results

From the above analysis of satisfaction survey results suggest the following conclusions:

1) The overall issues is raised by the questionnaire satisfaction scores did not exceed 50% of the total score, indicating the overall industry, renewable energy management policy for the country's low satisfaction.

2) We state the application of renewable energy is just the beginning stages, did not sound management system and the detailed management rules. Therefore, the satisfaction scores in the questionnaire were satisfied with B option to score over the other two choices.

3) Answer choice C scored the lowest, indicating the survey of renewable energy for national development is very much like to have better management of national policy.

4) The satisfaction questionnaire were the highest score is a healthy plant-level standard, indicating the current survey, most of the production enterprises engaged in renewable energy expertise, they are to the development of enterprises from the renewable energy industry to a certain promotion.

Through the above renewable energy law for China to improve the content of understanding known:

1) A renewable energy law in the actual operation is not able to give full play to the management of renewable energy should be the role and function. Strategy formulation is very accurate, but not a better organizational behavior management.

2) The state department in charge of renewable energy in China Development and Reform Commission, its own management of both renewable energy policy-making departments, while the coordination of departments, it is a major oversight. This has a lot of difficulties, one for the executive branch are easy to deal with the management of the affairs of the administrative agencies adversely buck each other. The lack of organization and management structure in the form of renewable energy, management structure, and organizational behavior management is not blocked; in accordance with the principles of organizational behavior management is necessary to establish service in the relevant industry sector structure.

3) Renewable energy law lays an emphasis on policy formulation (the strategic level), while the contempt of renewable energy in policy implementation, monitoring and management process (formulation and management of organizational behavior). Legislation which is also adopted the "should be broad rather than detailed" principle. Renewable energy legislation has led to the legal provisions which are too principled and abstract, in some places is difficult, some simply can not operate, such as renewable energy law which were referred to in Article XVII, "The State encourages units and individuals to install use of solar water

heating systems, solar heating and cooling systems, solar photovoltaic systems, solar energy.” In this section, which referred to "encourage" do not know what measures to "encourage"? To the price of solar heating is not currently available large area of the use of heating means, while solar refrigeration technical guidance how to encourage the development stage are also being installed on?

4) Another on the geothermal heat pump system is applied in some reports, but did not offer affordable heat pump system is to encourage the others? "Real estate development enterprises shall, according to specifications provided, in the design and construction of buildings for solar energy to provide the necessary conditions," this one among the real estate business is among the market economy of enterprises, with no policy guidance and related Department of mandatory provisions, how can make a reservation in accordance with the provisions of it? All of this illustrates the operability is not high, it is difficult to maintain the one hand, countries in the interests of renewable energy, but also very difficult to safeguard citizens and legal persons in the market economy among the legitimate rights and interests of society. Principle in place, but the uncertainty of organizational behavior directly affects the implementation of the strategy and objectives to achieve.

5) According to the Renewable Energy Law to formulate the implementation of the principle, it is difficult to reach lawmakers had expected to achieve. Renewable energy from existing power management configuration, the current state of institutional arrangements (multi-sect oral management of renewable energy) sectors involved in too many too many local interests, is difficult to quickly establish effective law enforcement. Far, China has realized this problem, but because of the current renewable energy covers a wide range of administrative power to bring the cross and distributed between the executive bucks, buck-passing problem in the future may be a long time. Therefore, we must quickly improve our renewable energy laws and regulations.

## 6 Conclusion

Under the current management of renewable energy analysis, I believe that improving the management of renewable energy from the strategic level, organizational behavior level, technical innovation is the following several aspects:

1) A renewable energy law, at the strategic level has been made a strategically advantageous position of renewable energy development direction, goals and strong. The principles of its legislation are the focus of renewable energy legislation, the provisions of the Government's authority and management scope. This is the strategic level issue in the state and advocated to manage the configuration of what is right, what is the configuration of executive power to oversee what the configuration of power problems. By addressing these issues, it determines the management of the Basic Law of renewable energy or "Constitution."

2) The management and renewable energy executive's perfection. Management and implementation is the focus of administration, to the management and implementation of legislation, he is the way to solve the management and implementation of workflow actions of legislation, by means of legislation regulating the management of work, while standardizing the implementation of the work of administrative authorities process and working methods and means, and not the punitive measures. Renewable Energy Law to ensure implementation of the principle.

3) Renewable energy management oversight legislation (regulations), includes the implementation of technical specifications and standards, in strict accordance with national standards of acceptance and punitive measures, operation monitoring, and data feedback.

4) Renewable energy management technology among the perfect. The state must to research and develop the renewable energy systems technology. National must be competitiveness and innovation core technologies with independent intellectual property strength.

Under the current management of renewable energy analysis, we deeply feel: As the renewable energy to manage their own problems, resulting in the application process in geothermal heat pump system in the management of problems. Improve the management of renewable energy is a very important and very complicated process; fully realize the improvement in the management of renewable energy will take a very long practice and exploration. This article from the case of heat pumps in the process of management reality, according to the management of which the above-mentioned problems, propose solutions to problems of management methods and means. It designs of a relative scientific management mode of heat pump system. A related model can be extended to other renewable energy technologies among management applications to. This can be targeted based on relevant experience improved management of these renewable energy problems. It speeds up renewable energy cause rapid

development.

**Appendix Table -1 (part)**

Unit Project	Products company			Real estate company			Design Consultation			Systems integration company			
	Smples	Number selected	Percentage	Smples	Number selected	Percentage	Smples	Number selected	Percentage	Smples	Number selected	Percentage	
1	A	29	3	10.34%	4	0	0.00%	12	3	25.00%	8	1	12.50%
	B	29	15	51.72%	4	4	100.00%	12	9	75.00%	8	5	62.50%
	C	29	11	37.93%	4	0	0.00%	12	0	0.00%	8	2	25.00%
2	A	29	0	0.00%	4	0	0.00%	12	3	25.00%	8	1	12.50%
	B	29	20	68.97%	4	4	100.00%	12	9	75.00%	8	6	75.00%
	C	29	9	31.03%	4	0	0.00%	12	0	0.00%	8	1	12.50%
3	A	29	0	0.00%	4	1	25.00%	12	5	41.67%	8	1	12.50%
	B	29	14	48.28%	4	0	0.00%	12	6	50.00%	8	5	62.50%
	C	29	15	51.72%	4	3	75.00%	12	1	8.33%	8	2	25.00%
4	A	29	0	0.00%	4	0	0.00%	12	1	8.33%	8	0	0.00%
	B	29	19	65.52%	4	3	75.00%	12	4	33.33%	8	7	87.50%
	C	29	10	34.48%	4	0	0.00%	12	0	0.00%	8	0	0.00%
5	A	29	11	37.93%	4	0	0.00%	12	2	16.67%	8	0	0.00%
	B	29	17	58.62%	4	4	100.00%	12	10	83.33%	8	8	100.00%
	C	29	1	3.45%	4	0	0.00%	12	0	0.00%	8	0	0.00%
6	A	29	0	0.00%	4	0	0.00%	12	1	8.33%	8	1	12.50%
	B	29	25	86.21%	4	4	100.00%	12	11	91.67%	8	6	75.00%
	C	29	4	13.79%	4	0	0.00%	12	0	0.00%	8	1	12.50%
7	A	29	0	0.00%	4	0	0.00%	12	0	0.00%	8	0	0.00%
	B	29	13	44.83%	4	2	50.00%	12	12	100.00%	8	7	87.50%
	C	29	16	55.17%	4	2	50.00%	12	0	0.00%	8	1	12.50%
8	A	29	1	3.45%	4	0	0.00%	12	1	8.33%	8	0	0.00%
	B	29	25	86.21%	4	1	25.00%	12	9	75.00%	8	8	100.00%
	C	29	3	10.34%	4	3	75.00%	12	2	16.67%	8	0	0.00%

**Appendix Table -2 (part)**

Unit Project	Navy Design Institute		Air Force institute		General Staff Design Institute		Qinhuangdao Architectural Design		Beijing Architectural Design Institute		Building Energy Conservation Center of		Total of summa	core Summa	average perce	
	Full marks	Score	Full marks	Score	Full marks	Score	Full marks	Score	Full marks	Score	Full marks	Score				
1	A	10	0	10	7	10	0	10	0	10	0	10	0	120	19	15.83%
	B	10	5	10	0	10	6	10	8	10	6	10	7	120	59	49.17%
	C	10	0	10	0	10	0	10	0	10	0	10	0	120	0	0.00%
2	A	10	0	10	6	10	0	10	0	10	0	10	0	120	17	14.17%
	B	10	6	10	0	10	5	10	7	10	6	10	3	120	49	40.83%
	C	10	0	10	0	10	0	10	0	10	0	10	0	120	0	0.00%
3	A	10	0	10	8	10	0	10	6	10	0	10	0	120	33	27.50%
	B	10	5	10	0	10	3	10	0	10	5	10	0	120	28	23.33%
	C	10	0	10	0	10	0	10	0	10	0	10	6	120	6	5.00%
4	A	10	0	10	5	10	0	10	0	10	0	10	0	120	11	9.17%
	B	10	6	10	0	10	6	10	8	10	7	10	7	120	67	55.83%
	C	10	0	10	0	10	0	10	0	10	0	10	0	120	0	0.00%
5	A	10	0	10	7	10	0	10	0	10	0	10	0	120	12	10.00%
	B	10	3	10	0	10	6	10	6	10	6	10	6	120	58	48.33%
	C	10	0	10	0	10	0	10	0	10	0	10	0	120	0	0.00%
6	A	10	0	10	5	10	0	10	0	10	0	10	0	120	5	4.17%
	B	10	5	10	0	10	5	10	5	10	6	10	5	120	64	53.33%
	C	10	0	10	0	10	0	10	0	10	0	10	0	120	0	0.00%
7	A	10	0	10	0	10	0	10	0	10	0	10	0	120	0	0.00%
	B	10	6	10	8	10	3	10	7	10	5	10	5	120	73	60.83%
	C	10	0	10	0	10	0	10	0	10	0	10	0	120	0	0.00%

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# An Empirical Study on Scenic Spot of Travel Brand Influencing Factor on University Students

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**Abstract:** College students, as a segment market of tourism industry, are contributing to a growing consumption in the whole market, which has drawn much attention of the marketers. According to the analysis of currently existed related literature, researches on the factors influencing college students in choosing tourism brands are rare to be found. On the basis of the analysis of literature, this paper combines brand theory, customer satisfaction theory and theory on tourist attractions, and by analyzing an author-designed scientific, reasonable and reliable questionnaire with SPSS, the author comes to some meaningful conclusion.

**Key words:** Brand; Scenic spot of travel; Survey design; Customer satisfaction; Multiple Analysis

## 1 Introduction

Nowadays people always look forward to a better Brand construction of tourist attractions and have a highly market requirements. The combination of rapid growth in the tourism industry, in the competition of economic globalization, knowledge production and consumption demand of personalized and the market environment, traveling scenic area brand will integrate into all aspects of the social life. In the face of increasingly sophisticated consumers, situations of intense market competition at home and abroad, making schedule as soon as possible for how to management the brand of tourist attractions, which has drawn much attention of the marketers.

Based on the exist Literature review, why research is crucial to market researchers has illustrating the importance of consumers value. First of all, consumers value evolved into consumer behavior from two important dimensions: the economy (for example values are links to detect price and it is commonly referred as transaction value) and psychological (the really factors that influencing product selection by customer: more emotion recognition and more reasonable). Secondly, from a methodological perspective, value structure can be interpreted into different parts of the consumer behavior: product selection (Zeithaml, 1988), purchase intent (Dodds&Monroe, 1985) and repeat purchases (Nilson, 1992). Thus, in academic research (Parasuraman&Grewal, 2000)and marketing management (Bolton, Kannan,&Bramlett, 2000), the price always closely related to customer loyalty. Third, price and major structures such as consumer behavior is closely related to quality and satisfaction. In all documents relating to services, look further at the distinction between satisfaction and quality, especially in the tourism literature, whether studies on external factors (Bolton&Drew, 1991; Ostrom & Iacobucci, 1995; Woodruff & Gardial, 1996; Oliver,1997; Day & Crask, 2000; Cronin et al., 2000) or internal (Yu • ksel&Yu • ksel, 2001a, b; Oh &Parks, 1997; Oh, 1999, 2000; Baker & Crompton, 2000; Brady, Robertson,&Cronin, 2001) tends to a further discussion of the value concept. In the early 90 's, some scholars have a further research on service quality, core value is consumer services assessment (Cronin&Taylor, 1992; Bolton & Drew, 1991). Since then, we have "three waves concept study of the services market" (Cronin et al., 2000): service quality, customer satisfaction and perceived value. But for the most critical of the concept and methodology of construction is to explore how to combine these three make the most out of their advantages. Compared with other areas, empiricism in the tourism literature believe that perceived value is very important for study and also suggested details examples; Studies revealed that in terms of quality, satisfaction and value model in the study of the relationship between a shortcut (Bojanic, 1996; Oh, 1999; Kashyap & Bojanic, 2000; Murphy et al., 2000)

## 2 Research Design

Based on literature analysis, brand theory, and tourism theory, and customer satisfaction degrees theory for guidance, through on tourism attractions object of market subdivision—college students, through questionnaire design, using SPSS17 version statistics software as analysis tools, on recycling of samples that: near 50 by in colleges and universities of freshman to senior, and different professional, and gender, and area, and income, of differences, and the questionnaire of 36 a problem for has corresponding of data statistics analysis. Come to scenic brand impact factors of college students based



on distribution of proposed a number of measures for promoting tourist brand impact. This survey is a survey on undergraduates nationwide, and focuses on investigation and understanding come from different professions, different regions, different family situations and different emotional experiences of their own differences in students' choice of brand of tourist attractions, as well as satisfaction and loyalty on influence factors for school students. Questionnaire issued mainly to network as a medium, the use of MSN,QQ,BBS, or group messages for all forms of questionnaire disseminated widely to friends and relatives around students, or are familiar with enthusiastic Netizen in the network. To a certain extent to ensure authenticity of the questionnaire was filled in and the recovery rate. This electronic document is expected to issue the questionnaire 260, 226 actual recovery of electronic document, including effective electronic questionnaire, 219, 86.9% per cent of the questionnaires, effective rate of 96.9%. Gender composition by try males slightly larger than females, 51.6% and 3 per cent respectively. Questionnaire relating to a wider area, colleges and universities in all regions have access to survey data and distribution more reasonable. Investigation focuses in Lake donghu, Wuhan University, Wuhan University, College, engineering, Wuhan University, zhongnan University, Huazhong agricultural University in the 6 universities, its share of valid questionnaires, respectively, 32.4%、5.0%、3.2%、2.7%、1.4%.

### 3 Data Analysis

#### 3.1 Reliability analysis of questionnaire

Reliability refers to the reliability or stability of the scale. Reliability standard coefficients are commonly used for measuring Cronbach's  $\alpha$  coefficient. The larger the coefficient, indicates a higher variable degree of internal consistency, describes the survey project has a good correlation between variables. Judging standards, scholars are not uniform, some scholars such as Nunnally (1978) argues that Cronbach's  $\alpha$  0.7 per cent, was the minimum acceptable value is greater than 0.8 has a good reliability and suggested coefficients between 0.35 and 0.7, up 0.7 means higher reliability, generally on each measurement Cronbach's  $\alpha$  coefficient 0.6 per cent is acceptable. This article uses SPSS17.0 software "reliability analysis" for reliability analysis of questionnaire data, based on standardized Cronbach total table's  $\alpha$  coefficient of 0.86 percent. Thus, the credibility of the survey was very strong.

**Table 1 Reliability Statistics**

Cronbach's Alpha	Based on the standard item Cronbachs Alpha	Item number
.775	.806	76

#### 3.2 Multiple analysis of influencing factors to tourism brand

Through multiple analysis of influencing factors, factors that affect students' scenic brand mainly for three areas: (1) Travel brands access to scenic information channels. For college students, many of them was through family and friends, as well as network access to information for these 3 aspects. Which friends and relatives on the number used is 23.3% per cent of the total number of searches on the Internet 31.4%, how college students beyond the relatively stable values, as well as a high degree of loyalty. Network audiences as a new generation of college students, the major brands should pay more attention to this aspect of tourist attractions information. (2) When a remote tourist influencing factors of brand you select scenic. College students' sensitivity to price is extremely high. Travel in remote, 21.2% against him in college students find affordable choice of brand of tourist attractions is the impact of a large factor. 16.6% in the school students think that security on remote travel choices greatly influenced brand of tourist attractions. 16.2% of students considered that integrity and visitor evaluations have a great impact on their chosen brand of tourist attractions. (3) The weekend while short-term factors that affect your choice of scenic brands. When you can see short visits on weekends, sort of factors influencing college students' choice brand of tourist attractions for affordable 27.5% security 15.8% a friend 13.3% integrity and tourists' evaluation on quality brand 9.6% reliable 13% service 13.2% service network is perfect 4.2% bundled customized reasonable 2.3%. As can be seen in most college students are price-sensitive, followed by safety requirements, and relatively low requirement of a brand is, in sixth.

#### 3.3 The analysis of customer's satisfaction to the brand of scenic spot of travel

Analysis on brand satisfaction survey of tourist attractions, there are the following five factors most affected. (1) The scenic brand awareness I evaluate the area greatly influenced the overall quality of service satisfaction. There are 31.1% students agree, agree somewhat 21.9% classmate, 15.1%

classmates disagreed. Over all quality of service satisfaction of this scenic spot Scenic spot of brand awareness in college students' evaluation is the larger impact. (2) Scenic overall spending has a higher cost greatly influenced to my satisfaction. Select agree somewhat to fully agree with percentages as high as 84.4%, so scenic overall spending has a higher cost for college student satisfaction evaluation of scenic brand impact is the largest. (3) The scenic tourist packages tailored for student groups launched a big influence on my satisfaction. 68.9% undergraduates for scenic spots launched customized for groups of students of tourism scenic spots tickets for student groups on tourist satisfaction a great representation of the brand was endorsed. From the point of view, groups of college students, for a relatively high price sensitivity is. (4) Safety factor in the tourism scenic spot high and low satisfaction had a great influence on me. 34.2% student select is fully agrees that 33.8% students choose agree, 16.4% of students selected is agree somewhat, 9.1% student select is hard to say, 2.7% student select is not agreed, 0.9% student select does not agree with. Visible tourist attraction within the safety factor of high and low for students enrolled in colleges and universities for brand satisfaction evaluation of scenic effect is particularly large. (5) Humanistic feature of the scenic area has the unique satisfaction had a great influence on me. 23.7% student select is fully agrees that 27.4% students choose agree, 23.7% of students selected is agree somewhat, 16% student select is hard to say, 4.1% student select is not agreed, 1.8% student select does not agree with, 0.5% student select is a completely different meaning. Indicate whether the area has a unique human characteristics of college students for the tourism brand satisfaction evaluation selection of effects is a very strong positive impact.

### **3.4 The Analysis of Consumers' Loyalty to the Brand of Scenic Spot of Travel**

There are many factors influence the brand loyalty to collage students' tourists, through the analysis of the questionnaire, the main factors influencing brand loyalty in scenic has two main aspects. (1) I would like to ask for my opinion of relatives or friends recommended me the satisfaction of tourist attractions. 27.9% student select is fully agrees that 38.4% students choose agree, 16.9% of students selected is agree somewhat, 11% student select is hard to say, 1.8% student select is not agreed, 1.8% student select does not agree with. From the Select results can be seen, this emerging consumer markets with great potential for college students, more inclined to seek the views of relatives or friends recommended me brand of tourist attractions. Description, University student groups, and such a market, to their favorite brand of tourist attractions, the loyalty of performance is extremely high. Therefore, tourism should be even more focused on brand communication efforts and the brand's service quality. (2) I would like to share wonderful travel experiences around. 38.8% student select is fully agrees that 35.2% students choose agree, 13.7% of students selected is agree somewhat, 10% of students selected is hard to say. Close to 70% of people around college students choose to share wonderful travel experiences. Tourism brand should pay more attention to groups of college students that consumer satisfaction and loyalty, thereby enhancing the competitive strength of their brand-building, and to expand their market share, lends itself to higher brand value.

### **3.5 The variance analysis of factors influencing the choice of difference to the brand of scenic spot of travel**

In order to understand the differences of brand choice of tourist attractions of college students, gender, specialty, grade, students, family structure, income variance analysis for six. (1) Analysis of factors affecting gender differences on the tourism brand of. Will men and women gender of differences on tourism scenic brand of select effects factors for analysis Hou, concluded that "can accept of for students of mass custom a tourism scenic brand packages of price range" of significantly sexual differences value for 0.047, and "family tour" of significantly sexual differences value for 0.000, and "gourmet" of significantly sexual differences value for 0.028, and "monuments" of significantly sexual differences value for 0.026, and "folk style" of significantly sexual differences value for 0.000, and "University campus" Significant differences in values of 0.014. (2) Factors affecting the differences on the tourism brand of the Professional category analysis. An analysis of the factors influencing differences in the Professional category the brand of choice of tourist attractions to conclude that "billboards in school" of significant difference value is 0.020, "brand awareness" of significant difference value of 0.058. (3) Influencing factors of different grades on tourist brand. Will is located grade of differences on tourism scenic brand of select effects factors for analysis Hou, concluded that "couples outing" of significantly sexual differences value for 0.051, and "10 service network perfect" of significantly sexual differences value for 0.027, and "entertainment" of significantly sexual differences value for 0.031, and "seaside beach" of significantly sexual differences value for 0.011, and "no brand scenic" of significantly sexual differences value for 0.048. (4) Home brand influence factor analysis of regional difference on scenic. Hometown regional differences in the analysis of the factors affecting the

choice of brand of tourist attractions to conclude that "economic benefits" of significant difference value of 0.006, "Cate" significant differences in value of 0.006, "entertainment" of significant difference value of 0.042, "brand-free area" of significant difference value of 0.037. (5) Family structure differences on influencing factors of brand of tourist attractions. Will family structure of differences on tourism scenic brand of select effects factors for analysis Hou, concluded that "tendencies select of tourism schedule" of significantly sexual differences value for 0.005, and "annually for tourism of spent probably is how many" of significantly sexual differences value for 0.000, and "travel agency Advisory" of significantly sexual differences value for 0.020, and "family tour" of significantly sexual differences value for 0.004, and "service quality reliable" of significantly sexual differences value for 0.080, and "security guarantees" of significantly sexual differences value for 0.033 And "integrity and tourists ' evaluation" of significant difference value is 0.017, "local character" of significant difference value of 0.025, "Cate" significant difference value is 0.002, "garden area" of significant difference value of 0.057. (6) Monthly income difference on influencing factors of brand of tourist attractions. Analysis of the factors affecting to "Monthly income difference", the choice of brand of tourist attractions to conclude that "annual spending on tourism is probably how much" significant difference value of 0.042, "solid economic.

#### 4 Conclusion

This subdivision of college students of potential tourism markets are gradually affected by tourism enterprises concerned, this article through questionnaire investigation and analysis of the factors affecting the students ' brand of tourist attractions, drew the following 3 points. (1) Creating City tourism brand, formed of intercity travel, the introduction of one-stop low price dining accommodations and tourist attractions packages. According to this survey found that 21.2% against him in college students still find affordable choice brand of tourist attractions is the impact of a large factor. 68.9% of undergraduates launched by the very respected scenic tourist packages tailored for student groups. I believe that tourism brands join hands, forming tourist city circle, the introduction of one-stop low price dining accommodations and tourist attractions packages, might better meet students ' requirements for cost-effective brand of tourist attractions. (2) Multidimensional multi-channel brand of tourist attractions, focus brands network propaganda, from the perspective of the emerging brand image, brand image of tourist attractions here to stay. Scenic brand awareness to college students evaluate the overall quality of service satisfaction of this scenic spot is 31.1% students expresses its consent, agree somewhat 21.9% classmate, 15.1% classmates disagreed. It can be seen that brand awareness for college students ' choice of tourist attractions had a bigger impact. For college students, know much about brand of tourist attractions from friends/relatives 23.3% and online search 31.4%, describes this huge potential customer base among college students, in addition to have relatively stable values, as well as a high degree of loyalty. And the network as a medium of popular media, network audiences as a new generation of college students, the major brands should pay more attention to this aspect of tourist attractions information. Due to modern highly developed network, college student before traveling on to pay special attention to tourism scenic spot of brand information. survey of undergraduates attaches, 37.4% of the students thought it has great importance for them to thoroughly understand the area's various information before traveling through a variety of channels. (3) Focus on the internal management, reduce operating costs, optimize the scenic quality of service of staff in the brand, and improving students ' groups on tourist brand satisfaction and loyalty. Almost 70% surveyed college students choose to "share wonderful travel experiences around." Thus, the brand of tourist attractions in the face of college student groups, and this huge potential consumer customers, brand communication efforts of tourist attractions and scenic quality of service, are of paramount importance.

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## Harnessing Environmental Sound Technology for Chinese SMEs' Environmental Sustainable Development

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**Abstract:** SMEs play a vital role in China's economy as generators of employment, revenue and innovation. With the unprecedented economic development of China, the important increase of SMEs amount is resulting to massive resources and energy consumption producing significant generation of waste by-products. In this article, we analyze the reasons that push Chinese SMEs to be reluctant or slow to implement efficiency measures and improved environmental practices, and illustrate the support of environmental sound technology to environmental sustainable development. We argue that Chinese SMEs are facing several challenges that limit their implementation of environmental practices and environmental sound technology: lack of environmental responsibility awareness, lack of technological absorptive capacity, lack of financial resources, difficulty to access conventional loans, and short-term economic perspective. Environmentally sound technology (EST) represents a necessity for allowing economic development without significant environmental degradation. Our main recommendations for Chinese SMEs to achieve environmental sustainable development include a strengthening of firms' technological absorptive capacity, implementation of "good housekeeping" procedures; building linkages between financiers of SMEs and EST owners and centers, providing support mechanisms to encourage the development of financial flows; diffuse EST through a combination of effective knowledge transfer and diffusion mechanisms; and finally promote technological and financial synergy with SMEs different stakeholders.

**Key words:** Environmental sound technology; Eco-Innovation; Chinese SMEs; Environmental sustainable development

### 1 Introduction

For centuries, China has been the nation that concentrated the highest population on Earth. Taking advantage of his huge national market opportunity, the low cost of the labor, the establishment of different reforms on several sectors, and the opening to foreign trade and investment, the country has been able to develop a strong economy heavily industrialized. However, the rapid economic growth of China is resulting to numerous economic challenges that the government need to solve regarding the reduction of environmental damage and social conflicts related to the rapid transformation of the economy.

China's over population and economic growth have made the environment extremely hazardous to the health and well-being of the country. China, since its economic reforms in 1978, has rapidly modernized causing environmental problems and in addition, huge investments in infrastructure have also brought about negative ecological impacts (Jean Yen-chun Lin, 2007). Most of SMEs are often unaware of their environmental impact or the environmental legislation affecting them (UNIDO, 2011). China's current environment degradation is rapidly increasing and similarly followed by growing awareness and interests of the public. The past year has witnessed a number of major pollution incidents resulting from the anger of the public to confront industrial environmental abuses, and on micro-blogging sites the public is more engaged on environmental issues than ever (Malcolm Moore, 2009).

With the government objective to become an "innovation-oriented society", massive investment has been done in terms of research and development to develop Chinese technological capacities and knowledge transfer. This initiative comes with the government program aiming to move from "Made in China to Created in China," and pursuing a less energy intensive development path with energy consumption growth lower than economic growth to the greatest extent possible (Yojana Sharma, 2010). This would make China's fast growth more sustainable with lessened adverse domestic and global environmental impacts. However, this can be only achieved if Chinese SMEs are massively participating to the government program. SMEs play a vital role in China's economy as generators of employment, revenue and innovation. By 2007, China had 42 million SMEs, which accounted for 99.7 percent of the total number of enterprises in the country. SMEs also accounted for more than 68 percent

of China's exports and 75 percent of the new jobs created nationwide each year, while registering more than 65 percent of China's patents (Lauren Hilgers, 2009). SMEs are a vibrant force for the sustained development of the Chinese economy.

As with their larger counterparts, Chinese SMEs exert considerable pressure on the environment, not individually, but collectively. SMEs are voracious consumers of resources and energy and the result is a significant generation of waste by-products. There are a number of problems that deprive SMEs from achieving their full potential: they use obsolete technology; lack finance; lack access to export markets; lack market information; are resistant to change; and, the decision-making is done by the owners of these companies. These problems contribute to the environmental degradation of China. In this article, we aim to analyze the reasons why SMEs may be slow or reluctant to adopt efficiency measures and improved environmental practices. After having highlighted the limit of Chinese SMEs on implementing environmental solutions to achieve environmental sustainable development, we seek to illustrate the support of environmental sound technology to solve environmental problems. Finally, we present set of strategies for the implementation of environmental sound technology for Chinese SMEs.

## **2 Why Chinese SMEs are Hesitant to Adopt Environmental Practices and Technologies?**

During the last several years, numerous SMEs in different provinces of China have been the target of media, environmental protests and environmental movement campaign because of their environmental hazards. China toys scandal (Jonathan Watts, 2007; Lee Moran, 2011) milk scandal (BBC, 2008), water pollution scandal (China Daily, 2011; Jonathan Watts, 2011) are some examples of incidents resulting from the lack of environmental integrity from some Chinese SMEs. Environmental scandal represent an important threat for Chinese SMEs. It harm deeply the brand image of SMEs since customers are losing their trust on the firms' products resulting to massive economic lost. Unethical behavior can no longer hide in the dark waiting around for an investigation to ensue. Wrongdoings are in an instant communicated to the world via computers and broadcasted by media.

As traditional business models primarily emphasize the economic aspects of a company's activities (e.g. profitability and growth), the massive environmental degradation, rising environmentalism among Chinese public and enterprises environmental scandal are shifting consumers preferences to SMEs adopting a business model socially and environmentally responsible (Setareh Korkchi and Azalee Rombaut, 2006). Regarding the competitive advantage of implementing efficiency measures and improved environmental practices, the question remains why many Chinese SMEs are still reluctant to invest on environmental practices and technology?

There are several reasons why SMEs may be slow or reluctant to adopt environmental-friendly management process:

First, many Chinese SMEs are often unaware of their environmental impact or the environmental legislation affecting them. The main reason is because many of them are family enterprises based on traditional business models (Jean Lee and Hong Li, 2008). Further, many SMEs lack the in-house expertise to identify and even properly implement environmental technologies. The principal challenge facing by Chinese SMEs is not their access to technology, but their absorptive capacity, including physical, human, and institutional capacity; and the extent to which their social and political environment is supportive of entrepreneurship, investment, and technological progress (UNIDO, 2011).

Second, SMEs often don't carry substantial assets or collateral and therefore have difficulty accessing conventional loans and credit. This lack of resources often leads to SMEs being risk-averse and less willing to invest in new environmental technologies; partly because the payback period of these investments is often over several years. Unlike larger companies, Chinese SMEs are limited in the scope that they can rely on internal financing and are therefore much more dependent on private external sources, whether through joint ventures or third parties. These include inadequate availability of working capital, banks insisting on collateral and third party guarantees, and a risk-averse banking system for small projects etc. Furthermore, banks generally perceive small projects as being high risk due to non-disclosure by the borrowers and lack of reliable information on technology, markets, and investment potential. Although, favorable loans (such as soft or revolving loans) for improved resource efficiency have encouraged producers, especially SMEs, to adopt changes to make production more efficient. However, SMEs commonly have difficulty accessing conventional loans, as they are often family enterprises lacking the necessary collateral (Lauren Hilgers, 2009). The inherent limitations on

private capital acquisition are made even more binding due to ignorance about the financial advantages of ESTs.

Third, SMEs also tend to have a short-term economic perspective, which often results in the perception that environmental management is peripheral to core business. The WWF (2010) survey on social responsibility and sustainability of Chinese companies has shown that 92% of the respondents said that they have adopted a sustainable development strategy. However, there exist differences between the positive expectations held by Chinese SMEs and their practices in reality. When asked which aspect of environmental protection is most important, relatively few companies said it was technological innovation. Only 32% of them suggested that technological innovation could be developed as a solution to reduce energy and natural resources consumption, and only 9% of the companies mentioned that they cooperate with other companies to find solutions for sustainable development. The way SMEs are organized and their operating procedures are significantly different from those in larger companies. SMEs are unlikely to have an environment division or a designated specialist responsible for environmental compliance and management in the company. 92% of companies claim to have formulated a sustainable development strategy, but only 50% of them have assigned departments or staff to be responsible for the coordination and management of sustainability and environmental protection. The most frequent approaches to this issue are passive, primarily donation (91%) and organizing employees for CSR events (77%). Additionally, proactive innovation of environmental protection and leading other companies is not yet popular, although 1/3 of the companies have started to pay more attention to 'green' innovation and hope to be leaders in environmental protection.

### **3 Environmental Sound Technology Contributions to SMEs Environmental Sustainable Development**

Persuading Chinese SMEs to develop their environmental performance is a challenging task since they need to preserve their competitive advantage and are consequently hesitant to adopt measures resulting to increased costs. Environmentally sound technology (EST) is needed for allowing economic development without significant environmental degradation. EST refers to technology that "protects the environment, are less polluting, use all resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more acceptable manner than the technologies for which they were substitutes" (UNIDO, 2005). EST is not just individual technologies, but total systems which include know-how, procedures, goods and services, and equipment as well as organizational and managerial procedures. This implies that when discussing transfer of technologies, the human resource development and local capacity-building aspects of technology choices, including gender-relevant aspects, should also be addressed. Environmentally sound technologies should be compatible with nationally determined socio-economic, cultural and environmental priorities.

In adopting ESTs, companies need to consider where the technologies fit into the five phases of product life cycles (design, production, distribution, use and disposal), and to think about not just the impact of individual pollutants, but the effects of the whole production process, which means adopting an integrated approach to pollution prevention and control. This approach includes: minimizing energy, materials and wastes used or created per unit of product; high process accuracy for the entire range of products; anticipating and preventing defects at each step in the process; system cut-off if defects are found; a workforce trained to ensure quality control at all stages. Almost all these systems will incorporate ESTs. There are a variety of general technology selection criteria for companies that, of course, include among other things: financial feasibility, compatibility with existing facilities, environmental acceptability and energy and water consumption. In technology choice, the accuracy of the selection depends on the technical capability of the recipients/end users and on the availability or data on alternative technologies.

In China, most companies currently base their pollution control efforts on end-of-pipe techniques, where the waste is treated before being discharged. This is not always the most effective mean for preventing pollution, especially when these facilities are not properly maintained. Although end-of-pipe technologies result in less waste, they have costs involved while EST, by reducing input materials, fines and disposal fees, has the potential for generating undiscovered profits. Although many people consider EST to be an expensive alternative in relation to end of pipe treatment, there are many low or no-cost options that can be implemented bringing economic returns almost immediately (UNIDO, 2009).

EST has immense potential in China and is an emerging market. The transfer of EST may produce economic benefits for all parties involved and the environmental protection will be enhanced through pollution prevention and resources conservation (Cristina Tébar Less and Steven McMillan, 2005).

#### **4 Strategies for Implementation of Sound Technology for Chinese SMEs**

Since most of enterprises make technological progress through implementation and adaptation of pre-existing technologies, the first step is to enable Chinese SMEs capacities to absorb new technologies. Building firm capability or “absorptive capacity” to enable companies to implement and adapt new technologies is critical. Knowledge and skills underpin the economic success and environmental performance of firms by providing the technological know-how or “capacity” to innovate and to adapt and adopt new technology solutions. More specifically, technical capacity facilitates the imitation and adaptation of foreign environmental technologies and improves the extent to which positive spillovers (e.g. resource efficiency) from FDI and trade accrue to the rest of the economy. Such firm capability can be obtained by programs that change the management of systems through training personnel, demonstrating the techniques for energy and raw material use, creating demonstration projects to reduce raw material, energy or water use, making limited funds available for small investments and providing resources to monitor and disseminate results. Some of these initiatives are relatively inexpensive ways to foster change (OECD, 2000).

The second step is the Chinese SMEs source of finance for EST. Many SMEs don’t often have the resources to invest in creating their own technical solutions. The introduction of “good housekeeping” procedures can yield immediate environmental and financial benefits for individual enterprises. Good Housekeeping’ refers to a number of practical measures based on common sense that enterprises can undertake to improve their productivity, obtain cost savings, and reduce the environmental impact of their operations (Rachid Nafti, 1998). Good housekeeping’ practices can provide a real economic asset and advantage for a company in terms of minimizing waste, as well as the use of raw materials and energy. Minimizing waste can enable enterprises to reduce the loss of valuable material inputs and therefore reduce operational costs. Further, the importance of official support and funding over the transfer of ESTs has reasonably successfully moved into areas such as technology demonstration, information dissemination, and partner-finding. There is a need to build linkages between financiers of small and medium enterprises and EST owners and centers, and provide support mechanisms to encourage the development of financial flows. Such linkages offer the potential to accelerate the transfer of ESTs, and to enhance the leverage obtained by public sector finance in a time of budget reductions (DESA, 1999). Financial support instruments, such as Research & Development (R&D) grants, tax-breaks, and venture capital funds are not only important for the creation of new and emerging technologies, but also for supporting the adoption and adaptation of existing technologies.

The third step is the diffusion of EST. Chinese managers may have no accounting tools to identify the costs of waste and pollution because they are hidden in overheads. In some cases, industries are just simply unaware of the technologies and practices that exist. Technological solutions already exist for many of the problems in the manufacturing and services sector; they just need to be diffused more widely among enterprises, and adapted to local circumstances. Dissemination and demonstration of the benefits of environmentally sustainable and resource-efficient industries (e.g. lower energy inputs, raw material usage) represent an effective way of fostering the adoption of new production methods. This requires a combination of effective transfer and diffusion mechanisms, along with increased capacity building within enterprises to enable the adoption and adaptation of new technologies (UNIDO, 2011). Chinese government can facilitate knowledge transfer and the diffusion of environmental technologies through infrastructures such as science parks, clusters, incubators, global networks etc.

The fourth step is the technological and financial synergy between Chinese SMEs and stakeholders. As we have seen above, official support from Chinese government and private investor represent an important factor to finance Chinese SMEs capacities to implement and adopt EST. Although, countries tend to acquire technology more readily when domestic firms have their own in-house R&D programs and when public or private technical institution and universities have close ties to industry, less than 50% of Chinese domestic companies take into consideration the environmental impacts of potential investment partners. Most companies are not aware of cooperation with NGOs and similar agencies. Just over half of the companies are unclear about whether they should cooperate with NGOs for environmental protection. Only 21% of companies said they already do, or intend to discuss the possibility thereof and nearly a third doesn’t want to cooperate with an NGO (WWF, 2010).

Furthermore, overall information disclosed by Chinese firms are not transparent enough (Ni Huan, 2011). Many Chinese SMEs have to acknowledge the importance of collaborating with technological institutions and NGOs, and solve their lack of transparency if they want efficiently implement EST and achieve environmental sustainable development.

## 5 Conclusion

China is experiencing an unprecedented economic development that both fascinates and, at times concerns the World's most advanced economies. The country has achieved a spectacular economic take off, multiplying its global weight seven times over the last thirty years, to become the second largest power in terms of nominal GDP and the first in terms of exports. However, the cumulative impacts of many Chinese SMEs exert considerable pressure on the environment. Although, many Chinese enterprises are now thinking about environmental impact throughout their product's life cycle and are integrating environmental strategies and practices into their own management systems, many remains reluctant to adopt and adapt environmental practices and EST. There are several reasons that explain why Chinese SMEs are hesitant to implement EST: many are unaware of their environmental impact or the environmental legislation affecting them; important lack of technological absorptive capacity; lack of capital to invest on environmental solutions; difficulty to access conventional loans; and short-term economic perspective.

In order to implement efficient strategies to adopt and adapt EST, Chinese SMEs have to build firm capability or "absorptive capacity" to enable companies to implement and adapt new technologies; implement "good housekeeping" procedures to yield immediately environmental and financial benefits; build linkages between financiers of SMEs and EST owners and centers, and provide support mechanisms to encourage the development of financial flows; diffuse EST through a combination of effective knowledge transfer and diffusion mechanisms; and finally promote technological and financial synergy with different stakeholders.

Although, many Chinese SMEs still have to face many challenges to harness EST to follow the path of environmental sustainable development, important progresses have already been done in terms of environmental degradation reductions, corporate social responsibility, and environmentally technological innovations. It is without no doubt that if more Chinese SMEs adopt efficient environmental practices and technologies, China will be able to achieve its objectives of economic growth and harmonious society.

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# The Study on Performance and Innovation of Spatial Shapes

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**Abstract:** The purposes of the architecture and interior design are to meet the needs of different groups of people's working, living, entertainment and some other requirements. So the core and essence of space design in architecture and interior design is to use emotional expression factors to produce visual stimulation for audiences; and then transform these visual stimuli into specific experience in order to make space to meet all the needs of the audiences from function to form. Through the analysis of different spatial form the basic point, line, surface combination of elements this study shows the relationships between the various elements of the combinations of space and the content of the potential language; then translate this essential language into the three-dimensional spatial form to express the emotion; to get the conclusion that the direction of innovative design of the spatial form and the emotional expression of different forms derived from the spatial elements themselves.

**Key words:** Spatial Shape; Performance; Innovation; Documentary research

## 1 Introduction

The modernists see buildings as living machines; they advocated in the form follows function; thus form its characteristics of monotonous, lack of emotion and too materialistic. Since the postmodernism architects began to consider the extension of history and so on; the form has no longer been limited by function; they pursue the innovation of forms under the premise of meet the basic functions; the emotional expression of construction has become the mainstream of the contemporary designers during their creations.

Nowadays the real estate boom in China leads to a rapidly development in architect design and interior design industry. However, the vast majorities of now a days design are attempt to meet the needs of the audience simply through the use of colors, materials and textures as well as light and the combinations of those elements; but as we know the core of constructions is the space; that is to say the purpose of constructions is to meet the requirements of space from separate individuals; of course, this requirement lies not only in the satisfaction of plane functions but also in the satisfaction of composite requirements brings by various spatial shapes. With the development of technology the spatial design of the information age have a stronger performance with the help of computers; this kind of performance is completely subvert the traditional concept of geometric space; the use of nonlinear shapes and a variety of distorted shapes make the space able to express more emotions with richer, stronger and more stimulate kind of language; of course, this connotation is directly linked to social form of the informational age; therefore, how to make better use of contemporary scientific and technological achievements to show the charm of contemporary designs is a urgent problem which contemporary designers want to solve.

## 2 Spatial Elements

Human express and transmit emotions mostly through literary or artistic works; such as paintings express emotions by using two-dimensional shapes. By refining visual language in paintings into geometric elements and systematic analyzing of the sentiments expressed by the different elements; Wassily Kandinsky found that these elements could be used in paintings and graphic designs with a purpose. Similarly, the geometric shapes in three-dimensional space could express the emotions that two-dimensional geometric elements can.

### 2.1 Point

In the book <Point and Line to Plane> Wassily Kandinsky think that the emotional characteristics of point are peace, quiet and its tension is inward. Point in the three-dimensional space could be a sphere; such as the National Centre for the Performing Arts (china) designed by Paul Andreu is a semi-ellipsoidal shape; and combine with its reflection in the water to form a complete ellipsoid. This ellipsoid has an inward tension which brings concise and stable; gentle and beautiful; harmonious and restrained feelings to the audience.

### 2.2 Line

Lines can express various emotions; different form and different directions of lines can express different emotions. The type of line is divided into three categories—straight lines, polylines, and curves according to the different forces exerted on lines.

#### 2.2.1 Straight line

The straight line is formed by a point which moves with an unchanged direction; these lines with features of concision and unlimited possibilities. Straight lines play a very important place in the modernist architectural space which esteem of less is more.

The different directions give a straight line of different emotions. The performance of the horizontal straight lines is cold and infinite; the vertical lines express the possibility of warm, the rising momentum can also be reminiscent of plant growth, the vitality of life which makes them opposite to horizontal straight lines. In addition to the horizontal and vertical lines there is a combination of arbitrary linear; the combination expresses unstable emotional momentum to split and break the plane.

#### 2.2.2 Polyline

The polyline is a straight line with external forces; the size of the force determines the angle of a corner in the polyline; the stronger force makes the angle the smaller and the rebound momentum greater. The polyline commonly used in the performance of grief after suffered the great harm; such as the top view of the Jewish Museum Berlin is a polyline composed of acute angles which is subject to powerful external forces from multiple directions; but also contains a powerful rebound momentum. Daniel Libeskind use such a typical polyline to the performance of the persecution suffered by Jewish and a strong consciousness of resistance.

#### 2.2.3 The curve

The meanings of the curves present in those arcs which compose curves. Arcs' formation requires three tension; one of which is opposite with the other two. The arc shows the toughness of the curve and the rebound momentum hidden in. Therefore, curves are often used in the place that needs a relaxed and vibrant surrounding such as the design of waterfront space; in the design of Benidorm Seafront designers use varied the shape of curves to echo with waves, adding vitality to the space and also to meet the functional requirements of coastal space for rest and recreation.

### 2.3 Plane

Based on the constructivist's theory, the emotion of a plane decided by those elements form the plane and the methods of combinations. Different elements make different sounds, the size and position of those elements determine the main emotion of the whole picture. Therefore, the selection and combination of elements have determined whether it's success or not of express the specific emotion.

In the composition of Falling Water, the horizontal elements have occupied dominant positions; its form language is calm and peaceful. The scattered arrangement makes sure the plane not to feel dull; but two weak vertical elements in a relatively central location will strength the sound of vertical elements; the sound of this combination shows more peaceful than movement. The design intent is to emphasize the natural properties of the building in order to integrate the building into a tranquil natural environment; but at the same time as to meet the function of life the construction cannot looks like too boring; thus the vertical elements of the building added some vitality for the plane.

### 2.4 The non-linear shape

Strictly speaking, all natural forms are nonlinear shapes; the linear forms are the results of natural form though simplify and summarize with the help of mathematical methods. In recent years due to the development of computer-assistant design and engineering advances in construction the non-linear form can be built. The nonlinear form becomes more and more in contemporary designer works because of its infinite possibilities and new and peculiar spatial experience.

The appearance of the non-linear form will change unpredictably with the changes of the points of view; so it's impossible to express specific emotions in all aspect. And it's difficult to find separate point, line and plane elements on the appearance; so the constructivist method cannot use to analyze the emotional features of nonlinear forms. The tensions of non-linear forms are three-dimensional; the form is a result of numerous external forces; but in order to make it separate from the emotion of the point form there must be some of the forces showed out those forces determine the momentum and emotions of the non-linear form.

## 3 Proportion and Scale

### 3.1 Proportion of the form

Proportional relationship between shapes determines the strength of the sounds of forms in the

space; no space could only formed by one shape, it must be composed of a variety of shapes. Such as the elevation of Barcelona Pavilion formed not only by a single horizontal elements there are vertical elements in the space; but the proportional relationship between the two forms is very clear- the tension of the horizontal direction was significantly stronger than the tensions of vertical shapes; so the audiences' initial feel of form is its emotion expressed by horizontal elements these are quiet and broad.

### 3.2 Scale of the form

The spatial scale refers to the size of the shape and the distance between shapes which can express emotions in the space. The use of scale could make tremendous impact on the emotion of the audience in the space especially in the interior design. The greater the shapes are the weaker the affinity shows; if the distance between shapes becomes smaller compares to the scale of the shape it conveys to the audience a greater pressure; which explains why people live a life in metropolis all of skyscrapers easier to be anxiety and feel depressed.

## 4 The Performance of Emotions

One emotion is not only corresponding with one visual experience; for example, beautiful can be used to describe a single flower and can also be used to describe the dance; beautiful can be static scenes and also can be dynamic visual experiences. So the expression of emotion must first choose the most common experience that the story we all familiar about. The second step is to select spatial elements; using accurate space elements to perform the story and scenes. Finally, to determine the proportion and scale of the form element and organize those elements with the appropriate form; thus completing the spatial composition to express a particular emotion. I will express four emotions-throb, grace, miserable and stun as examples in 4 separate space of 9 m\* 5m \* 8m to prove the feasibility of the spatial elements could express a particular emotion.

### 4.1 Throb

The explanation of throb is a flustered heart with an excited mood; it can be likened to the mood when one seeing his or her valentine. Lot of people have the experience of waiting for someone in the airport or train station; when our sight searching the crowd we will feel confused and disturbed and when finally found the target the throbbing mood appears instantly and then restore to calm right again.

Select two elements of two opposite emotions - the horizontal element and vertical element; then organized multiple horizontal elements in the space densely and randomly to create a loss and quiet atmosphere; place the only vertical form in a location away from the audience close to the wall and when the light shine on the horizontal elements audience's attention will be focused on the vertical elements and bring emotions of the audiences' out of the confusion to the climax; the throbbing emotions appear instantly.

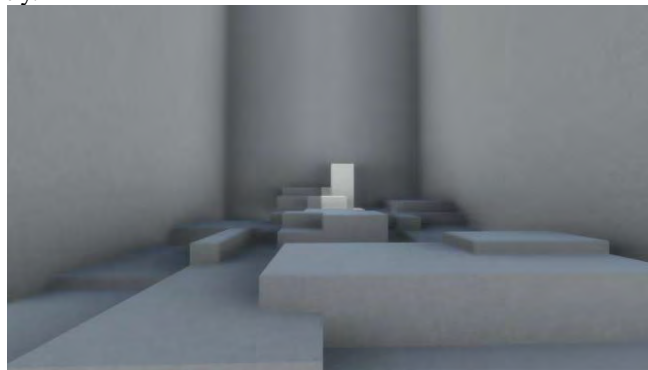


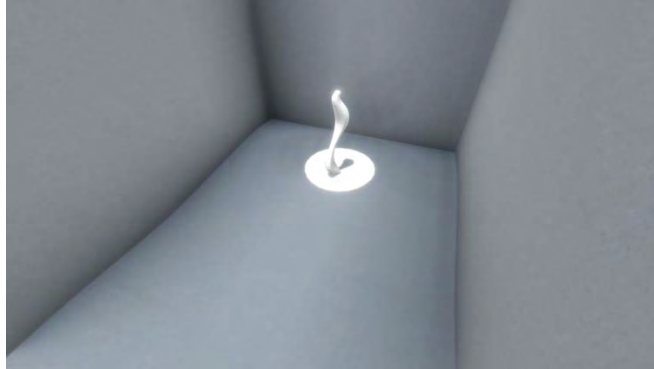
Figure 1 Picture of Throb Space

### 4.2 Grace

Grace has many characteristics such as harmonious, delicate, light, fresh, elegant, etc.; so the shapes been chosen must be static, flexible, with no conflict or contradiction. Ballet contains all these features; the scene in the ballet Swan Lake when swan dancing in the moonlight is a graceful visual experience; so the elements could be the beautiful and gentle curve with slightly undulating surface signify the lake surface and the swan neck.

Beautiful space must have simple and elegant features; so only two elements organized in the space a horizontal elements and a vertical elements; use small ups and downs of non-linear surface instead of the horizontal ground and brings a serene feeling to the audience; the vertical non-linear shape been

placed on the main position; the light and soft feature are highlighted in the sunlight. With the utilize of characteristics of the nonlinear shapes; the audiences in the space are able to observe the beautiful changes of the shape from different angles like a gentle and soothing ballet dancer's dance.

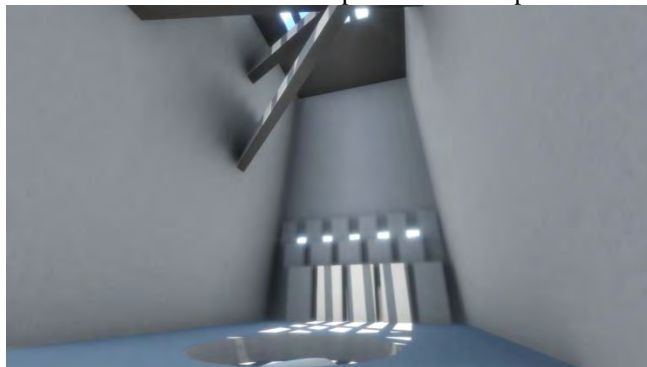


**Figure 2 Picture of Graceful Space**

#### 4.3 Miserable

Miserable refers to the desolation and sorrow, is often used to express feeling when separated with friends and relatives or life to death. Helpless old people, orphans or other vulnerable people in novels or movies often convey a miserable mood to the audience. To create a cold and depressing space with a small-scale soft shape placed in the center; with such a strong contrast to highlight the theme of the vulnerable and helpless, as an expression of miserable mood.

Cold and unfriendly space is often reflected in the large-scale and hard straight shapes; use these shapes densely arranged in front of the wall facing by audience and overlay those shapes to strengthen the pressure of shapes. The horizontal shapes scattered and interspersed above the ground; on one hand could strengthen the pressure from the top and on the other hand split the light from the top; with the effect of light and shadow to enhance the miserable mood. The main part has been shaped into the small-scale soft shapes and the contrast between the shapes and scale expressed the miserable mood.



**Figure 3 Picture of Miserable Space**

#### 4.4 Stun

Surprised and shocked when seeing a very beautiful scene is the emotional characteristics of stun. Stunning mood often created by nature; I was shocked when the first time I saw the scene of Snow Mountains. The image of the mountain is rise and full of change especially the endless variations of light and shadow created by the sunshine

Organize vertical forms with upward trend to imitate the shape of the mountain; the highest shape should taller than 4m to create a looking up angle for the audiences. By changing the skylights shape to lead irregular sunlight into the space; as the sun moves the light and shadow changed smoothly on the shapes. The vagaries of the beauty bring audiences a stunning experience.

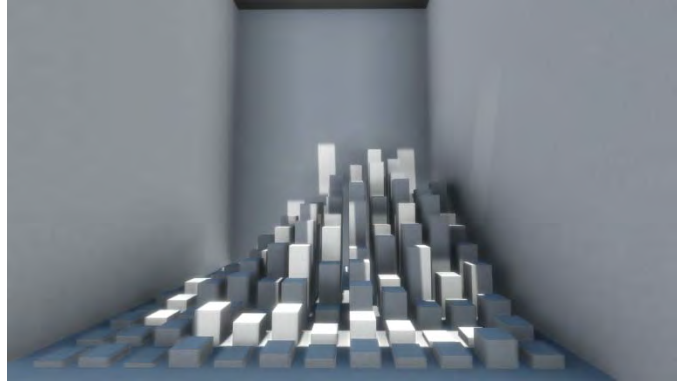


Figure 4 Picture of Stunning Space

#### 4.5 The Jewish Museum Berlin

designed by Daniel Libeskind. The museum would like to tell a story about the bloody massacres and brutal persecution of the Jewish during World War II; the story is a Jews in concentration camps suffered the oppression and torture, witnessing the death of his companions and crazy massacre and desperately wanted to flee from the camp. Though the ups and downs he could see the distant hope but the constant disappointment eventually brought about despair to the fate.

The point of the museum space is oppressive, the fear of death, disappointed, and finally in despair. The form of the spatial shapes is hard and straight, the scale of shapes is much larger than the scale of human body; the space is narrow and compact in order to express audiences with pressures. The space indicates the hardships of the escape process with the narrow and long space; the huge and sloping walls create a feeling of constriction and a tense atmosphere; bright and high skylights above show the distant to hope; dark corner exudes the fear of death and the unknown future; finally, the museum has no exports express the despair to all the audiences.

#### 5 Conclusion

Consciousness itself has instinctive reaction to spatial forms; this reaction is direct, without thinking and doesn't have to transform by experience. More and more designers are realizing through the use of spatial elements can achieve the purpose of expressing a particular emotion; this language compared with other languages-color, material, and the mechanism is more simple, more direct and more powerful. Due to the differences of personal experiences; they would choose different shapes and organized in different ways when it comes to express the same emotion; so the innovations of space are endless. As a new methods to express moods in space the use of spatial shapes must base on a clear understanding of the sentiments expressed by the spatial elements and then through the combination and organizations of elements to achieve the purpose of accurately expression of emotion.

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## Analysis on Location Factors of Logistics Industry in the Process of Urban-Rural Integration\*

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**Abstract:** With the location theory, this article lays a great emphasis on programming problems such as the choice and allocation of key location factors including logistics hinge, logistics area, logistics center and terminal distribution network in the development of logistic industry. It constructs a model or mechanism of related factors programming, and explores the logistics industry's status and function in the process of urban-rural integration. In addition, it also comes to a conclusion that these factors are both cores and joint points in the integration of urban-rural resources, with a direct influence on the strength, speed and density of urban-rural integration.

**Key words:** Urban-rural integration; Logistic industry; Location factor

### 1 Introduction

One of the limitations in China's modernization is the speed of rural civilization progress, while urban-rural integration is the crucial pattern to speed up rural civilization promotion. As a source for third profit in human society reproduction, the logistics industry plays a leading role in the urban-rural integration. The analysis on location factors in the logistics industry will accelerate the agglomeration and restructuring of urban-rural resources.

Location factors are defined by Professor Li Xiaojian as the influential reason for location subject distribution, with impacts on certain natural, economic and social conditions and factors. In the early 20th century, a German economist Alfred Weber published Theory of the Location of Industries (1909), became the first one who advanced the concept of location factor. From the perspective of economic location, he studied on industrial production activities of production, circulation and consumption in social reproduction process. And he pointed out that, productive places are determined by location factors, which attracted enterprises into a site with lowest production expenses and highest cost-saving expenses. In 1927, Harshorne R., an American geographer, adopted the concept of location factor in Location as a factor on geography. Notice of National Major Function oriented Zoning, printed and distributed by the State Council on 21st, February, 2012, shows the role of location factor in economic and social development in depth.

Location factor in logistics industry mainly refers to logistics hubs, logistics parks, logistics centres and terminal distribution nodes. This article aims at further exploring the programming, distribution and influence of location factors with related location theories and positive experiences.

### 2 Scientific Programming of Location Factor in Logistics Industry

One of the crucial indexes in urban image standard is urban efficiency, and the core element of urban efficiency is logistics. Since in the flow collection of people, goods, information and capital, the flow of goods plays a backbone's function, a scientific programming of location factor in logistics industry is significantly needed.

#### 2.1 A Macro-distribution of Logistics Hub

A hub is an important component element of comprehensive transportation system, and centrum in operation coordination and combined transport organization. Transportation centrum is a multi-functional transportation complex formed in the process of several transport patterns or trunk lines' cross-cutting and convergence. With the development of China's transportation and logistics management conception, the comprehensive transportation system structured by various transport equipments has gradually developed into a complex system combined by equipment, information and

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transport organization, and has become a vital carrier in logistics development.

A logistics hub is a comprehensive integration of logistics facilities, which relies on comprehensive transportation, with a close inter-cooperation, rational division, convenient transport patterns and functions of inter-regional transferring, exchange and connection of main logistics. A logistics hub is usually located in centre cities of logistics, with a few in important logistics node cities.

The distribution of a logistics hub is influenced by regional city type. The geological distribution of plain city, mountainous city and costal city has a direct impact on the density of logistics hub distribution. This is because the type of city determines the logistics cost in the city. Plain cities have advantages in road transit, railway transit and air transit. Mountainous cities regard air transit as main, road transit and railway transit as secondary. In costal cities, marine traffic has a more obvious advantage, while road, railway and air transits are changing in different conditions in plain and mountain areas.

The distribution of logistics is generally in freight transfer cities, which is determined by logistics cost. Logistics cost is mainly consisted by transfer cost and costs of storage, handling and trucking in stations. Logistics cost(Lc) is a function of many variables, including transport distance(d), transport method (m) and place cost(Pc).

$$Lc=f(d,m,Pc) \tag{1}$$

Among four common transport methods, including air transfer, railway transfer, road transfer and water transfer, the long-distance transfer cost of air transfer is the most higher, and then are road transfer, railway transfer and water transfer. The relationship between transfer cost (Tc) and transfer distance (d) is demonstrated as Figure1.

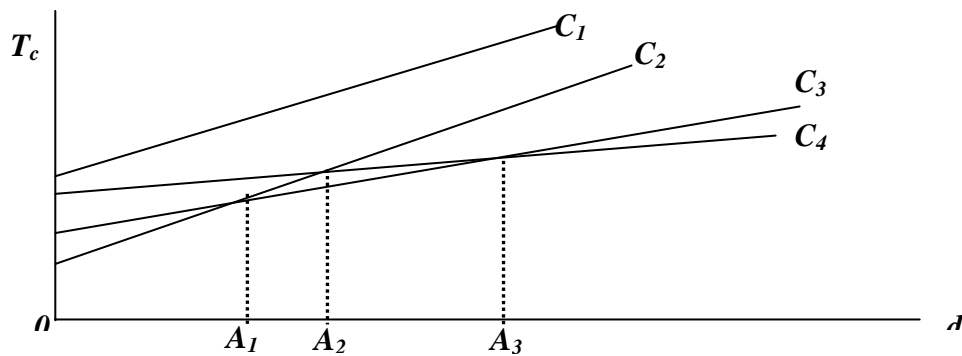


Figure 1 The Relationship Between transportation Cost and Transportation Distance

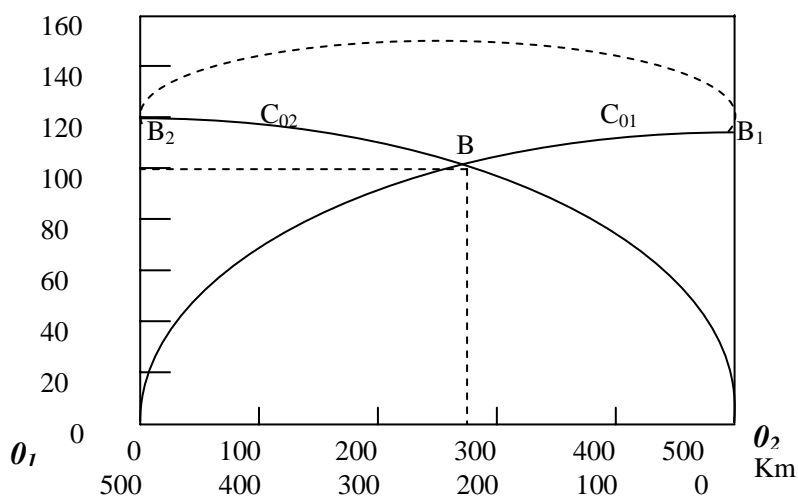


Figure 2 Location Map of Logistics Hub



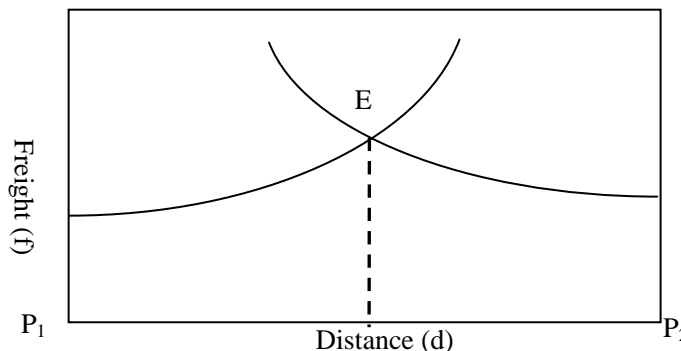
Suppose the good's ton-kilometre fee is 0.20 Yuan, the transfer fee of Company A from O1 and the transfer fee of Company B from O2 with opposite directions can find a common location (shown as in the area BB1B2 in Figure2), according to the long-distance decremental conduction of logistics cost and transfer fees. Since point B makes the vehicle fee from O1 and that from O2 achieve a balance from the perspective of long-distance decremental conduction, point B is theoretically regarded as the optimum location of freight transferring.

In practical operation, transfer cost changes with different types of commodity, and different transfer methods and their fees are largely different as well. Therefore, the Marco-distribution of logistics hub can be confirmed on the scope as mentioned above when it is integrated with regional true statistics.

**2.2 A rational choice of logistics area**

As the downstream node of a logistics hub, logistics area is an emerging logistics distributing pattern produced in a certain period of logistics industry development. In space, it is a central-distributed place of various logistics facilities and different kinds of logistics enterprises, as well as a logistics assembly point with a certain scale and comprehensive service function. In fact, to rationally program a logistics area, is not only helpful to avoid disordered distribution of logistics centre and distribution centre leading to problems such as land resource waste and serious influence on city traffic, but also beneficial for logistics enterprises to get both scale benefit and concentration benefit, so as to rapidly accelerate an effective development of logistics industry.

Since logistic area is an important component of regional economy, in choosing it rationally the boundaries model of market areas of two producers under the condition of income decrease suggested in Zone theory and shoe leather industry written by American economist Hoover can be referred to. Because logistic area performs the function of store, process and transportation, etc, the logistic park operation cost in addition to influenced by store, process and etc factors mainly take into account of transportation. Logistic area as intermediate node of logistics operation, under the condition of limited coverage area freight increase as downstream node far away from the logistic park will inevitably occur, at this time, and the best boundary of logistic park P1 and P2 market area is intersection E of Hoover boundary (shown in Figure3)



**Figure 3 The Market Dividing Point of Logistics Park**

In actual operation, factors which influence the layout of logistic park still have the number of regional city, industry development degree, urban and rural resident density and topography distribution and etc. Confirm the area of logistic park we generally consider the following contents:

(1) Estimate the immediate and long-term cargo throughput of logistic park (t)

Warehouse capacity tonnage of the park = the annual throughput/ annual turnover

Estimate the required warehouse capacity tonnage according to throughput and take accounts of annual turnover of park cargo.

(2) Estimate the used land of the park(s)

The land area of the park can be deemed as the sum of warehouse land, yard land, processing land and auxiliary transportation land. Calculate warehouse or workshop area use ratio, load of unit area, building storey, building density and etc .

Warehouse land area (s<sub>1</sub>) =(Warehouse capacity tonnage × Into the warehouse coefficient) / (Load of unit area× use ratio of warehouse area× storey × building density

Yard land area ( $s_2$ ) = [ Warehouse capacity tonnage  $\times$  (1- Into the warehouse coefficient)] / (load of unit area  $\times$  use ratio of warehouse area)

Workshop land area ( $s_3$ ) = (park processing tonnage  $\times$  unit processing area/ use ratio of workshop area)

Auxiliary transportation land ( $s_4$ ) is confirmed according to multi-modal transport and the relevant cargo throughput.

Therefore, The park land area  $s = s_1 + s_2 + s_3 + s_4$  (VI)

### 2.3 A specialized identification of logistics centre

A logistics centre is a facility and institution which is set up to receive and deal with purchasing order information from downstream customers, finish tasks like centralized storage and processing of bulk merchandise from upstream suppliers, and batch transfer to downstream customers. A modern logistics centre is a comprehensive logistics centre with an integration of various transport methods, including air, road, railway or water carriage terminal.

Modern logistics centre is the multiplier of enlarging location advantage. Modern logistics centre plays an important role in social circulation field and supports the whole logistics network. It not only plays an important role in optimizing the logistic network but also performs the link up, coordinator and hub role in the circulation infrastructure of the whole society. Whether Logistics element in any area such as airport, dock, railway, land route, freight centre and kinds of commercial networks can play their roles and realize expected design ability, the modern logistics centre does perform the multiplier role. Only with the support of transition and distribution role of modern logistics centre can circulation infrastructure function be enlarged and logistics condition and logistics efficiency get improvement. In one sense, lacking modern logistics centre will inevitably result in a waste of infrastructure and circulation element resource within the region. The defective development of modern logistics centre also severely affects the effective performance of infrastructure function.

The modern logistic center is the host platform of developing modern circulation. The modern logistics is marked by transportation rationalization, storage automaton, package standardization, load and unload mechanization, processing trade integration and management network informatization. The modern logistics center as rear-service economy department of chain enterprise provides the host platform for the modern logistics, playing an important role in the operation of management and having already became the main site to generate economic benefit among time and space which connects production and consumption and solves supply and demand conflict. The operation of modern logistics center can realize minimum circles, shortest delivery distance, lowest cost and maximum benefit. The modern logistics center elongates circulation industry chain, expands the circulation industry space and efficient allocation of circulation resources.

The modern logistics centre is an organic combination of material flow and information flow. The modern logistics centre achieves the unification of business flow, material flow, information flow and capital flow, which gradually become the centre of commodity of collecting, distributing, processing, commodity trade, price-forming, information-published, inspection and quarantine. With the performance of processing and supporting roles such as online transaction, electronic clearing, forward business and regional purchasing, professional logistics personnel are depended on to improve the informatization, modernization and internationalization standard of modern logistics.

The specialized identification of logistics centre is divided into two aspects. One is to achieve the specialization of logistics products, concentrated on transport, storage, processing or distribution of one certain type. Two is to achieve the specialization of logistics expertise. After a long-term operation, logistics centre has a production-supply-marketing integration consisted with specialized teams, tools and routes as well as certain customers.

Since most of modern logistics centres have not reached a specialized level, we need to speed up specialized integration to meet the demands of rapidly upgraded urban-rural integration distribution. All the circles from the informationalized transformation of enterprises themselves, to the confirmation of specialized products and certain routes, and to the improvement of personnel qualities need to be intensified.

After the specialized logistics centre is confirmed, reasonably choosing the site is undergoing. The choice of logistics centre site is restricted by place of manufacture of logistics products, category, upstream enterprise, targeted customer factors. The choice of logistics centre site directly affects the cost of each activity of the centre at the same time relevant to the normal operation and development of the centre. So the choice of logistics centre and layout must base on sufficient investigation and analysis

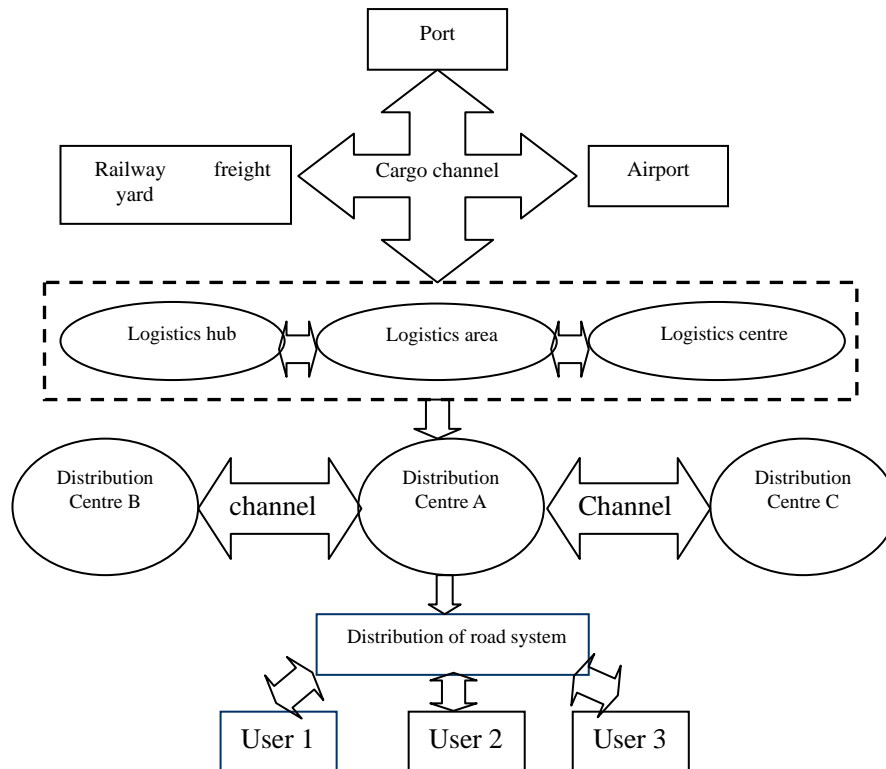
taking account of the characteristic of self-operating, the features of operating commodity and the surrounding traffic condition factors, which makes detailed analysis based on the current condition and prediction to choose the site of logistics centre. The basic premise is the vehicles “could come into, go out”.

**2.4 The network of terminal distribution node**

Terminal distribution node is at a relatively important status in logistics activities, due to it pays great attention to the systematic principle of logistics. The stronger the concept of systematic logistics is, the more emphasis will be put on overall coordination, smooth and optimization. Terminal distribution node is on a position that connects the system, and it also represents the overall level. Logistics nodes in modern logistics network lead a crucial role in the optimization of the whole logistics network. By the look of development, it not only performs general logistics functions, but also performs more and more functions of nerve centres, such as managing and information processing. It is the soul of the whole logistics network, and therefore, it is given more and more attention.

The setting of network distribution nodes encounters limitations, like the business volume of distribution enterprises, the practical requirements of target customers and urban traffic pressure. The few network nodes are beneficial to save fundamental facilities’ cost and make the large-scale operation of distribution centre much easier. But the practical service level is not helpful to open and occupy target market. Since antinomy is an existing problem of many links in logistics businesses, a scientific overall planning is necessary when pursuing an overall optimization and rationalization of distribution network nodes in the logistics field of view.

The planning of distribution network nodes should take the support of logistics fundamental facility platform into account, which includes distribution centre, cargo channel, foreign ion transport fundamental facilities and distribution road system. A distribution centre is a key and breakthrough point of integration and optimization of regional logistics systematic resources. Cargo distribution road system is a indispensable element of realizing the connection of high-speed road, airport and railway, and influencing the achievement and efficiency of goods as well. The distribution network structure is not only limited by transport dock ports, railway goods yard and airport, but also influenced by the logistics hub, logistics area and logistics centre of upstream nodes. Meanwhile, it has a close relationship with the optimization level of distribution pattern. The relationship among fundamental facility elements of distribution network nodes is shown in Figure 4.



**Figure 4 The Urban-Rural Distribution Element**

### **3 The Impact of Logistics Industrial Location Factors on Urban-Rural Integration Process**

Urban-rural integration is neither to connect urban and rural areas with reinforced-concrete-structured buildings, nor to cancel the existing space of agriculture. Instead, it is to sequentially take on a new visage with co-existence of primary industry, secondary industry and third industry. It means the living standard, civilized literacy, recreational activities, traffic and living condition in urban and rural areas to meet an integrative standard. To achieve this, location factors in logistics industry will undoubtedly play a promoting role.

#### **3.1 Timely goods support the equality between urban and rural areas**

Urban civilization itself integrates various functions, including living, business, office work, going out, cultural entertainment, social activities and traveling. Through methods of compound functions, mutual impacts and mutual value chain, urban civilization forms a comprehensive urban system with high intensity and convenient living standards. One of the core connotations of urban civilization is the timely accessibility of goods in demand.

If the planning of location factors in logistics industries confirms the density of nodes according to the geographical features of urban-rural areas, set up a specialized direction of logistics centre according to the needs in regional economic development and citizens' consumption desire, build docking facilities of logistics transport patterns such as airport, port and station, according to fast-response objects, overall-planned logistics location factors will inevitably realize the timely accessibility of goods movement.

The timely accessibility of goods meets the consumption demands of urban-rural citizens. On the premise of fully covered information network, the timely delivery of on-line goods and the household distribution of daily necessities will increase the living taste of rural residents who stem from idyllic sceneries, improve psychological index of urban-rural equality and accelerate the integration of urban-rural living concepts.

#### **3.2 The reduction of logistics cost in promoting urban-rural integration**

A rational program of location factors in logistics industry will inevitably form the optimization of logistics pattern and logistics routing, so as to realize the minimum of logistics cost. As the experiences of advanced countries' urbanization process show, when the adequate and systematic service level achieves a certain height, a trend of suburbanization in urban development will be presented, with continuous urban line or rural cities.

In some degree, the distribution of logistics network has inter-attractiveness, devoting to concentration effecting the construction of residential settlement. Therefore, the planning of urban-rural integration has to consider the logistics network program as main content, and the minimum node of logistics cost as the ideal residential settlement. In line up with such standard, the construction of new rural or urban areas will have a sustainable development vigour and dynamic.

In the process of urban-rural integration, the largest difficulty is the removal and reconstruction of residential settlement. The integration of urban and rural areas will be promoted effectively, if government proactively injects a certain number of expenditure into the construction of logistics node network, increases the intrinsic value of newly programmed residential settlement through inexpensive logistics cost and directs residents' expectation by it.

#### **3.3 The upgrade of logistics products in promoting urban-rural civilization**

The transformation of ticketing methods in spring rail put migrant rural workers who are the largest group of floating population into a passive position. Consequently, it requires the buyers to have relevant knowledge background when buying tickets through advanced online ticketing method. With the improvement of informationalization level, online marketing, e-commerce and household distribution will be an important part of urban civilization in the future, and the concept of non-core business outsourcing will rapidly penetrate into residents' consumption idea.

As a vital component of modern service industry, the speed of logistics industry's transition and promotion is also accelerating. Three sides, logistics enterprises, logistics industry and government, will research on the upgrading problem of logistics products according to market direction. New products of logistics enterprises, new leagues of logistics industry and new policies of local government will jointly create a fair and competitive environment for new logistics products to exist, compete and develop, in order to realize a healthy upgrade and evolution of logistics industry.

For logistics industry as a significant element of social civilization, the upgrade of its products will inevitably improve the civilization grade of the whole society. The upgrade of logistics products fully

demonstrates a series of advanced concepts, such as rapid response, delayed production and personalized service. The formation of these concepts will pull the progress of behaviours and good social behaviours will naturally promote the whole urban-rural civilization.

#### **4 Conclusion**

The agglomeration of reform and opening up achievements over the past three decades have broken the binary structure in urban-rural areas in China, with the pace of urban-rural integration quickening. The status of location factors in logistics industry during the urban-rural integration process cannot be ignored. Many key elements including logistics hub, logistics area, logistics centre and logistics terminal distribution network are both a main part and a binder in the integration of urban-rural resources. The level of optimized distribution and scientific programming of these location factors have a direct impact on the aggregation strength, speed and density of urban-rural integration. Due to a serious unbalance of production development level in China, the research, development and utility of location factors in logistics industry in some developed costal areas have won initial success, while how to essentially perform the functions of location factors in logistics industry still has a long way to go.

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# The Perceived Destination Image of Hangzhou City of China as Received in the Travel Blogs of Western Tourists

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**Abstract:** This study explored travel blogs as a manifestation of travel experience, along with the destination image of Hangzhou city of China from the perspective of western tourists. Frequency analysis, semantic network analysis as well as content analysis were taken in this study which aims to reveal the perception of western travelers to Hangzhou. The data for this study was from the blogs of western tourists who had been to Hangzhou. Empirical results revealed that the overall perceived destination image of Hangzhou was positive, with particular strengths in tourist attractions and major weaknesses in meals and transportation.

**Key words:** travel blogs; Hangzhou; destination image; Western tourists

## 1 Introduction

Destination image which provides an important basis for consumers' purchase destination influences tourist decision making and, consequently, their behavior and destination choices.<sup>[1]</sup> Destination image formation and psychological characteristics help to shape the image, develop marketing strategy and promote the core competitiveness of a particular destination.<sup>[2]</sup> In this study, Hangzhou was chosen as the tourist destination for this qualitative blog data collection. In 2011, as the fifth largest inbound tourism city in China, Hangzhou received more than 3 million inbound tourists—11.1% increase over the previous year (CNTA, 2012). For selling points of Hangzhou in its outbound tourism market, researchers had reached a consensus—selling points should vary in different markets. Thus, in order to promote the outbound tourism market of Hangzhou in western countries, it is necessary to conduct a study about the destination image of Hangzhou from the perspective of western tourists. Up to now, there are some scholars who have conducted latent researches on the destination image of Hangzhou from the aspect of the tourists' perception. However, from the view of travel blogs, few studies have been done. The effects of travel blogs on destination image have been largely overlooked. Blogs present a new and easy means of experience-sharing, where both positive and negative electronic word-of-mouth are exchanged.

This sharing of information has undoubtedly had a direct impact on destination.<sup>[3]</sup> In this study, frequency analysis, semantic network analysis as well as content analysis are taken which aims to reveal the perception of western travelers to Hangzhou. The data for this study is from the blogs of western tourists who have been to Hangzhou. The purpose of this study was to, from a marketing perspective, assess western tourists' opinions posted on leading Internet travel blogs to better understand the experience being communicated about the strengths and weaknesses of Hangzhou.

## 2 Literature review

### 2.1 The perceived destination image and its impact on tourism

Researchers stated that the perceived destination image plays an important role in consumers' purchase decisions, consequently, their behavior and destination choice.<sup>[4]</sup> Foreign scholars have reaped bumper academic achievement. Gartner put forward eight types of destination image agents, including overt induced I image, overt induced II image, covert induced I image, covert induced II image, autonomous image, unsolicited organic image, solicited organic image and organic image.<sup>[5]</sup> Echter and Ritchie undertook an empirical analysis, settling the essential elements which engender when the perception striking tourists.<sup>[6]</sup> Gallarza et al. reviewed the methodologies of empirical studies of destination image.<sup>[7]</sup>

### 2.2 Tourist information search behavior and travel blogs

Tourism is an information-intensive industry and the tourist organization markets their products and builds customer relationships through various channels. Internet has become one of means for tourists to seek travel-related information, which is more effective and flexible compared with the traditional types of media such as advertisements, personal experience, advice from friends and relatives. The development of Internet is inevitable for its extensive source of pre-purchase information. It has

been found that an increasing number of consumers were relying on online opinions when making decisions<sup>[8]</sup>, which is especially true for tourism products because of their features of exclusivity and untransferability.

In the Internet era, consumers become “the media” themselves.<sup>[9]</sup> The web provides consumers with various channels, from which they are able to access the others’ opinions of tourist destinations. Bloggers judge online blogs to be more trustworthy than other types of media.<sup>[10]</sup> Travel blogs, as narratives, provide textual artefacts of consumer identity and sense-making and narrative analysis of these texts offers a commonsense approach to developing a deeper and more meaningful understanding of tourists’ experiences and behavior.<sup>[11]</sup> Recently, researchers suggested that travel blogs provided a new way of understanding consumers’ perceptions of a destination, its products, and service. After analyzing travel blogs on Charleston, South Carolina, Pan et al. (2007) identified strengths and weakness of the destination. Choi et al. (2007) compared the image of Macau represented in different online information sources. Similarly, Wenger (2008) analyzed blog entries relating to Austria and found that blog authors are quite different from Austria’s market in demographics and touristic characteristics.<sup>[12]</sup>

### 3 Methodology

In this study, diverse means were adopted to investigate further relationship between bloggers and the tourist destination as well as grasp insight into the meaning of blogs. The text contained in blog was analyzed by frequency and semantic network analysis, after that, the text of each gathered blog entry was analyzed by content analysis.

#### 3.1 Data collection

An essential reason for choosing Google as the search engine is that Google’s PageRank algorithm ranks documents based on popularity, which was put forward by Brin and Page in 1998. What’s more, Google is generally identified as the most popular and reliable search engine through the world. As a result, two top travel blog sites travelblog.org and travelpod.com were selected in terms of the rank of Google. These sites have a hierarchical directory of blogs (continents, countries, provinces and cities). All travel blogs on China, Hangzhou were downloaded from the two sites. Besides, all travel blogs analyzed in this study were created from December 2005 to April 2012. Totally, 127 blogs were collected up to April 18, 2012. The remaining valid 102 blogs were placed in a master file for qualitative data analysis. Each blog retained its title and identification information.

#### 3.2 Data analysis

After detailing the 102 blogs, frequency analysis, semantic network analysis and content analysis were employed in this study. In order to acquire what the greatest concern of western tourists, the frequency analysis was chosen to analyze the full text of 102 blogs. After analyzing, the high- frequency keywords were built into a semantic network. The adjacency of two keywords represents their relative distance of semantic meaning, meanwhile the relative frequencies of words or phrases and the relative distance of them reflect the correlation of their meaning. Content analysis was the third method used in this study. While classifying data, a coding and classification system was adopted to analyze the content efficiently and clearly. As can be seen in Table 1, the categories were labeled meals, hotels, transportation, shopping and attractions. Each category included subcategories. Different evaluation criteria were settled according to different items. The number of the accumulated positives, negatives, neutral comments and the percentage of negatives were the basis of the content analysis.

**Table 1 Category, Subcategory and Evaluation Criteria**

Category	Subcategory	Evaluation Criteria
Meals	By the type of cuisine (e.g., Asian, Western)	Price, products, service ,environment, other
Accommodation	By the type of accommodation (e.g., hotels, hostel)	Price, room, service, environment, other
Transportation	By the type of transport (e.g., buses, taxis)	Fare, convenience, environment and user friendliness, other
Shopping	By the type of goods (e.g., tea, silk products)	Price, service, other
Attractions	By the name of attractions	Positives, negatives

### 4 Results

As a manifestation of communicated travel experience, travel blogs express the attitude of visitors

towards Hangzhou. The results of frequency, semantic network analysis and content analysis for travel blogs presented the strengths and weaknesses of Hangzhou as a notable tourist destination in detail.

#### 4.1 Profiles

The demographic information of bloggers was acquired from the hosting sites where bloggers were permitted to post their personal portraits, disclose their gender and hometown in the traveler profiles. Despite a small minority of bloggers were from Canada, Switzerland, France, Spain and Germany, most of them lived in USA and UK. For those users who disclosed their gender, male users were more than females in this segment, with 30 females (44%), 38 males (56%) and 12 blogs owned by couples or families (13%). For the blog profiles, except for some bloggers posting several pieces for one trip to describe their experience, the most users preferred producing one posting for the description of one trip. The majority of blogs were composed after the trip, and the rest were posted the same day the trip was taken. In the blogs, the number of words ranged from 2 to 3121, and every blogs contained photos.

#### 4.2 Frequency analysis

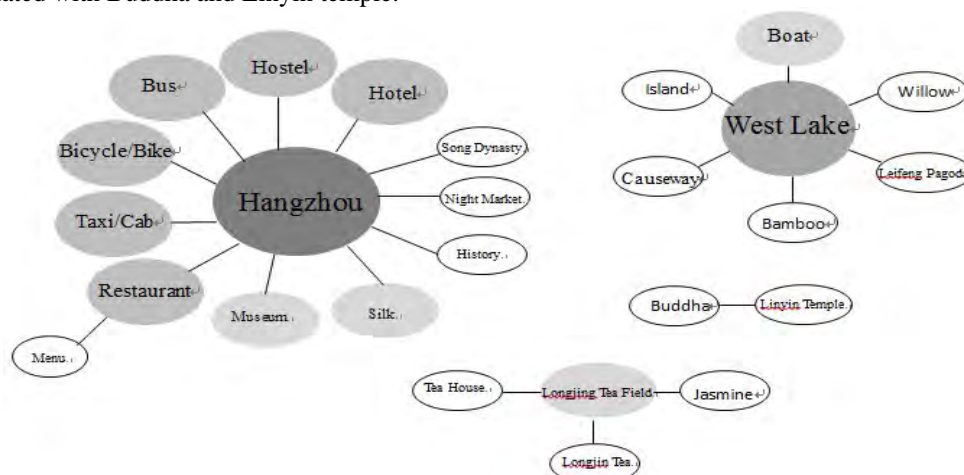
Table 2 revealed the most frequently used keywords or phrases in travel blogs. It demonstrated the priorities travelers focused on, and it expressed many aspects of travel experience in their travel blogs, including meals, accommodation, transportation, shopping and attractions.

**Table 2 Most Frequent Keywords in Blogs for Hangzhou City of China**

Keywords	Frequency	Keywords	Frequency	Keywords	Frequency
Hangzhou	307	boat	45	bamboo	14
West Lake	136	silk	26	menu	14
hostel	97	Longjing tea fields	26	Lingyin temple	11
bus	70	island	26	Tea house	8
bicycle/bike	67	history	24	Leifeng pagoda	7
taxi/cab	67	night market	19	willow	7
hotel	59	Buddha	17	jasmine	7
restaurant	51	Causeway	15	Sony dynasty	5
museum	45	Longjing tea	14		

#### 4.3 Semantic network analysis

Based on frequency analysis, semantic analysis presented a clear and valuable framework for the construction and analysis of communication content of Hangzhou. In the Figure1, a large frequent occurrence of keywords was illustrated by a larger and darker colored circle and vice versa. As can be seen, Hangzhou is the most dominant cluster with accommodation, transport tools and some other tourist attractions. The second cluster is West Lake as the major tourist attraction of Hangzhou. Three keywords related to Longjing tea field belong to the third cluster. In addition, there is also a small cluster associated with Buddha and Linyin temple.



**Figure 1 Semantic Network of Travel Experience to Hangzhou City of China**

#### 4.5 Content analysis

After the text of each collected blog was analyzed, a coding and classification system was adopted and the texts were categorized by meals, accommodation, transportation, shopping and attractions.



Every category included subcategories.

1) Meals

As Table3 shows, compared with the 51 total sentences of comment, there are only 5 comments for bars and pubs indicating that western tourists attached more attention to Chinese food but less to bars and pubs. Additionally Japanese and Korean food won more praises from bloggers. Specifically, Chinese cuisine was most often commented among bloggers, but its prices generated a relatively large number of negative comments.

**Table 3 Coding Categories and Number of Positive and Negative Comments for Meals**

Coding categories	Positives	Negatives	Total Sentences	% of Negative Sentence	Coding categories	Positives	Negatives	Total Sentences	% of Negative Sentence
Asian food					Bars and pubs				
Chinese food					Price	0	3	3	100
Price	1	4	5	80	Products	1	0	1	0
Products	27	12	39	31	Environment	1	0	1	0
Environment	0	0	0	0	Other	0	0	0	0
Other	0	6	6	100	Subtotal	2	3	5	80
Subtotal	28	22	50	44	Western food				
Japanese/Korean food					Price	0	0	0	0
Price	0	0	0	0	Products	2	0	2	0
Products	4	0	7	0	Environment	1	1	2	50
Environment	0	0	0	0	Other	0	1	1	100
Other	4	0	7	0	Subtotal	3	2	5	40
Subtotal	8	0	14	0					
					Total	42	28	70	40

2) Accommodation

Both bloggers who chose hostels and these who preferred hotels poured less attention to price and room. The detailed results are listed in Table4. Regarding hostels, bloggers were discontent with the service and hotels received the most negative comments on environment.

**Table 4 Coding Categories and Number of Positive and Negative Comments For Accommodation**

Coding categories	Positives	Negatives	Total Sentences	% of Negative Sentences	Coding categories	Positives	Negatives	Total Sentences	% of Negative Sentences
Hotel					Hostel				
Price	0	0	0	0	Price	1	0	1	0
Room	0	0	0	0	Room	1	0	1	0
Environment	1	1	2	50	Environment	3	1	4	25
Service	2	1	3	33	Service	0	4	4	100
Other	2	0	2	0	Other	1	2	3	67
Subtotal	5	2	7	29	Subtotal	6	7	13	54
					Total	11	9	20	45

3) Transportation

As Table5 shows, among 26comments on transportation, 65% comments were negative. All comments on buses and taxis were negative. In contrast, bicycles and boats received a relatively high proportion of positive comments.

**Table 5 Coding Categories and Number of Positive and Negative Comments for Transportation**

Coding categories	Positives	Negatives	Total Sentences	% of Negative Sentences	Coding categories	Positives	Negatives	Total Sentences	% of Negative Sentences
Buses					Boats				
Convenience	0	1	1	100	Convenience	0	0	0	0
Fares	0	0	0	0	Fares	0	1	1	100
Environment and user friendliness	0	1	1	100	Environment and user friendliness	1	0	1	0

Other	0	1	1	100	Other	0	0	0	0
Subtotal	0	3	3	100	Subtotal	1	1	2	50
Taxis/Cabs					Trains				
Convenience	0	1	1	100	Convenience	1	0	1	0
Fares	0	0	0	0	Fares	1	0	1	0
Environment and user friendliness	0	1	1	100	Environment and user friendliness	1	0	1	0
Other	0	4	4	100	Other	0	3	3	100
Subtotal	0	6	6	100	Subtotal	3	3	6	50
Bicycles/Bikes									
Convenience	1	0	1	0					
Fares	3	0	3	0					
Environment and user friendliness	1	0	1	0					
Other	0	4	4	100					
Subtotal	5	4	9	44	Total	9	17	26	65

4) Shopping

As shown in Table 6, shopping in Hangzhou received a total of 27 comments, one-third of which were negative. The categories that had the highest percentage of positive comments were tea and silk products, especially for silk products, all comments of which were positive. However the range of clothing and accessories, appliances and digital products fall shorts of expectation.

**Table 6 Coding Categories and Number of Positive and Negative Comments for Shopping**

Coding categories	Positives	Negatives	Total Sentences	% of Negative Sentences	Coding categories	Positives	Negatives	Total Sentences	% of Negative Sentences
Tea					Jewelry				
Price	1	0	0	0	Price	1	0	1	0
Products	4	0	4	0	Products	0	0	0	0
Other	3	1	4	25	Other	0	0	0	0
Subtotal	8	1	9	11	Subtotal	1	0	1	0
Silk products					Groceries				
Price	0	0	0	0	Price	1	0	1	0
Products	1	0	1	0	Products	0	1	1	100
Other	1	0	1	0	Other	4	1	5	25
Subtotal	2	0	2	0	Subtotal	5	2	7	29
Clothing and accessories					Appliances and digital products				
Price	0	3	3	100	Price	0	3	3	100
Products	0	0	0	0	Products	0	0	0	0
Other	1	0	1	0	Other	1	0	1	100
Subtotal	1	3	4	75	Subtotal	1	3	4	75
					Total	18	9	27	33

Attractions

The results revealed the diversity of travel experience in Hangzhou. As shown in Table7, attractions in Hangzhou received a total of 146comments, only 6% of which were negative. Compared with other 4 categories, attractions received the highest percentage of positive comments.

**Table 7 Coding Categories and Number of Positive and Negative Comments for Shopping**

Coding categories	Positives	Negatives	Total Sentences	% of Negative Sentences	Coding categories	Positives	Negatives	Total Sentences	% of Negative Sentences
West Lake	37	2	39	5	Longjing Tea Fields	14	1	15	7
Leifeng Pagada	5	0	5	0	Wushan Square	1	0	1	0

Botanical Gardens	1	0	1	0	Museum	57	2	59	3
Yue-Wang Temple	1	0	1	0	Song Dynasty	5	0	5	0
Dreaming of the Tiger Spring	2	0	2	0	Wushan Birds and Flower Market	1	0	3	67
YunQi bamboo path	3	0	3	0	Hideout of Linbiao	1	0	1	0
Linyin Temple	5	0	5	0	Chongyi Church	3	0	3	0
Klippe	1	2	3	27	Overall Impression	28	5	33	15
					Total	165	14	179	78

#### 4.6 Strengths and Weaknesses as Reflected from Travel Blogs on China, Hangzhou

A total of 341 comments were extracted from 102 western travelers' blogs, with 253 positive and 88 negative comments. Strengths and weakness identified in the coding process, as shown in the Figure2. Three out of four comments were positive (74.2%), that is to say, most travellers expressed their favor to Hangzhou. Looking at the major categories, the results showed that attractions were the major strengths of Hangzhou while most complaints came from meals and transportation.

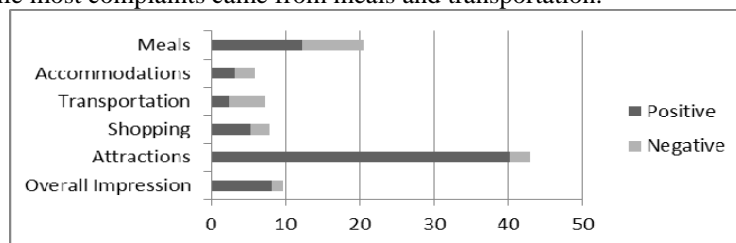


Figure 2 Percent of Positive and Negative Sentences in Travel Blogs on Hangzhou

#### 5 Conclusions

This study analyzed the destination image of Hangzhou as revealed in the travel blogs of western tourists. Analysis of blogs on travels in Hangzhou revealed strengths and weaknesses of this city. The results revealed that the major strengths of the destination of Hangzhou lie in its attractions. Besides the West Lake which is the most charming attraction, the temples and museums also received a wide range of praise. The major weaknesses of Hangzhou were meals and transportation. There were unfavorable perceptions about the price of food and beverage and service of restaurants, which ask local restaurants to control the price as well as improve the service. As for the transportation, bloggers' complaints were mainly about traffic congestion which caused by the growing number of vehicles and the traffic violations of drivers, passengers as well as pedestrian. Additionally, foreigners also confused about the language barrier which was a big factor affecting their trips. Thus, to solve the traffic problems, Hangzhou government should intensify the publicity and education to improve the levels of citizen qualities. Furthermore, in order to improve the service on accommodation, hotels and hostels need to recruit good workers as well as organize staff training. Lastly, marketers have to orient Hangzhou tourism to the needs of public, highlight the strengths of Hangzhou as a tourist attraction and send the correct message conceptually to western travelers.

It is important to note several limitations of the study. First, the findings were not generalizable over foreign visitors to Hangzhou. The sample was not stratified based on demographic variables such as nationality, age and gender. Second, only manifest content was analyzed in this study. In the course of this research, myriads of photos were found along with the main text. Hence, future research analyzing the study with visual pictures to obtain a more comprehensive understanding of the image of destination would provide more comprehensive implications.

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# The Research on the Sustainable Growth of Listed Companies in Chinese Steel Industry

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**Abstract:** Based on the development status of listed companies in China's steel industry, this essay selected 33 companies in the steel industry listed in Shanghai and Shenzhen Stock Exchange before 2006 after removed those having special conditions, such as "ST" companies whose stock exchanges were specially treated because of consecutive losses, and companies experienced a major business restructuring, etc. With the Robert Higgins' sustainable growth model, we tested the sustainable growth of the selected listed companies in the steel industry between 2006-2010 by using Wilcoxon's signed rank test. The empirical results show that the samples have not achieved sustainable growth whether as a whole or separated year by year. We also concluded that there was an increasing gap between the real growth rates and the sustainable growth rates in five years, which indicated that it was very serious for these companies to blindly pursue high-speed growth, and the financial sustainable growth in the steel industry has not got enough attentions in these companies. So it is not optimistic to achieve sustainable growth for listed companies in the steel industry.

**Key words:** Steel industry; Sustainable growth; Listed companies

## 1 Introduction

Since the 1980s, China's steel industry has made considerable progress that is crude steel production ranks first in the world year after year with an average annual growth rate of 21.1%. In 2007, crude steel production reached 500 million tons accounting for 38% of global production, realized the profit of 243.6 billion yuan accounting for 9% of the total profit of industrial enterprises and the amount of employment directly engaged in the production of steel was up to 3.55 million, which can be said the steel industry made outstanding contribution to the sustainable and rapid growth of the national economy. However, with the rapid development of the steel industry, it inevitably appears the steel enterprises' one-sided pursuit of capacity and the industry's over-expansion. Especially since the spread of the global financial crisis in 2008, China's steel industry has been suffered a serious blow, all kinds of contradictions accumulated for years of the extensive development have suddenly broken out, so that many large steel enterprises shutdown to reduce production and other conditions. According to the China Iron and Steel Association statistics, the profit of the entire iron and steel enterprises in 2008 is only 84.6 billion, declining 43.70 percent. To ensure the sustainable operation of the steel industry, the Ministry of Industry and Information Technology (referred to as the Ministry of Industry) in 2009 January launched "The steel industry restructuring and revitalization plan", trying to restructure and revitalize the steel industry.

The steel industry is the pillar industry of China's national economy and the basic industry related to national economy and people's livelihood, which has played an irreplaceable role in China's industrial modernization process. As a raw material production and processing department, the steel industry is in the middle position of the industry chain. Its development has a strong correlation with the country's infrastructure and the speed of the industrial development, so a relative fluctuation of the steel industry will have effect on China's overall economic stability and development. Therefore, the research on the sustainable growth of the steel industry has important significance to make sure sustainable development of China's economy.

## 2 Literature Review

In 1959, Penrose presented and studied sustainable growth in his enterprise growth theory preliminary. Later, Leibenstin's the road to growth model (1960), Starbuck's research on organization growth motivation (1965), Baumol's enterprise behavior, value and growth (1967) and Chandler and others' research on the growth stage (1962) studied and presented enterprise growth rate from different aspects, too. Unfortunately, for the problem of enterprises growth rate economists only made qualitative theoretical analysis and lack of rigorous logical mathematical model.

In 1977, financial expert Robert . C . Higgins<sup>[3]</sup> began to research the growth of enterprises from

the quantitative aspect and established corresponding sustainable growth model. He defined enterprise sustainable growth as: “based on the support of the enterprise financial resources which will not produce adverse effect on the enterprise growth in future, enterprise sales or assets can achieve a state of sustainable growth.” The connotation of enterprise sustainable growth is to show enterprise can't focus on short-term rapid growth, and should make the enterprise growth match with its own financial resources and the ability to obtain financial resources to enable enterprises to maintain a steady growth in the long term. It requires no matter under what circumstances, financial resources must meet the growing needs of enterprise, that is, the growth rate must be supported within a limit by financial resources. The core indicators of sustainable growth theory (Robert · C · Higgins, 1977)<sup>[3]</sup> is the sustainable growth rate. He believes that the sustainable growth rate (SGR) refers to under the conditions of issuance of new shares and maintaining current operation efficiency and financial policy, the company could achieve sales of the biggest ratio. Among them, operation efficiency refers to net profit margin on sales and asset turnover ratio; financial policy refers to dividend payout ratio and capital structure. Meeting above conditions, the real sales growth rate and the sustainable growth rate are equal. Its computation formula is:

$$SGR = P \times A \times T \times R \quad (1)$$

Among them,  $P$  refers to net profit margin on sales,  $A$  refers to asset turnover ratio, for rights multiplier, retained rate for income,  $T$  refers to equity multiplier, and  $R$  refers to retained earnings rate.

After Higgins, more financial experts dedicated to study and construct the sustainable growth model of enterprises.

Van Horn (1988)<sup>[4]</sup> defines sustainable growth rate as sales may reach the maximum growth rate based on predetermined operating rate, debt ratio and dividend payout ratio. Van Horn's sustainable growth theory is actually consistent with Higgins', that is, the increase of assets from the increase of liabilities and shareholders' equity. However, Van Horn stresses that the sustainable growth rate is the target value not the actual value and he put forward the sustainable growth rate is sales may reach the maximum annual growth rate based on pre-established management, debt and dividend payout target ratio.

American scholar Rappaport (1980)<sup>[5]</sup> put forward Rappaport Model on the basis of considering the cash flow, in which Rappaport thinks sustainable growth should be consistent with sustainable value creation. According to Rappaport's definition, the value refers to shareholder value. He believes that sustainable growth should bring about sustainable increase of shareholder value. However, high-speed growth of many enterprises not only didn't make the increase of shareholder value, but reduce shareholder value. So he put forward enduring growth that is the maximum business growth every year based on not raising new shares, locking operating profit margin and the growth of investment corresponding to every dollar of sales growth, target asset-liability ratio and target rate of dividend distribution. He thinks that the enduring growth ratio is the growth rate when cash inflows equal to cash outflows, which could be a method to measure the feasibility of a financial plan.

Coray (2003)<sup>[6]</sup> in his book *Corporate Strategy* discusses the relationship between cash flow and growth rate. By setting a series of assumptions, such as asset-liability ratio and dividend payout ratio remaining unchanged, current assets, current liabilities and fixed assets of the same percentage growth with sales and so on, he estimates cash flow and growth rate and point out that the relationship between cash flow and growth rate is a negative linear correlation, that is, when the actual growth is greater than the growth rate, the cash flow is negative, but when actual growth is less than the growth of the cash balance, cash flow is positive. So he according to this to define the growth rate when the cash flow is equal to zero as the growth rate of the cash balance (Cash-based Growth Rate), that is the sustainable growth rate.

After the above model other financial scholars have taken into key financial elements of cost control and so on and research method of gradually liberalizing assumptions to make the sustainable growth model closer to reality.

### 3 Model Selection

The above mainly introduces four sustainable growth models. Among them, Higgins' sustainable growth model and Van Horn's sustainable growth model are calculated based on accounting-caliber sustainable growth model, but Rappaport's and Coray's sustainable growth model are sustainable growth model based on cash flow caliber.

Higgins studies the enterprise financial sustainable growth from a static perspective. The advantage of his model is to answer those financial factors that influence and restrict the growth of the enterprise and the model is simple and easy to operate. Van Horn sets sustainable growth model when the company's operating efficiency and financial policy change and segment the model for the static and dynamic. Its advantage lies in researching the growth of the enterprise from the dynamic aspect, which matches to the dynamic business environment of the enterprise, but the maneuverability of the model is poorer. Rappaport Model calculates the sustainable rate from cash inflow and outflow, concise and easy to understand, but it regards net income directly as the source of cash inflow, which does not fit with the model establishment logic. Considering the above problems, this essay adopt Higgins' sustainable theory and its model to research.

On the basis of the definition of the sustainable growth rate Higgins (1981)<sup>[21]</sup> deduces enterprise sustainable growth equation, this equation based on the following assumptions:

(1) The company intends to have the growth rate the same as the growth allowed by market conditions;

(2) Managers may not be or do not want to issue new shares;

(3) The Company has and intends to continue to maintain a target capital structure and target dividend policy.

In order to increase sales next year, enterprises must also increase such as inventory, accounts receivable and other assets and production capacity. Because it is already assumed that the enterprise does not issue new shares, the cash needed because of increasing assets must be retained from the profits and the increase in liabilities. In other words, under the condition of not changing the capital structure, with the growth of shareholders' equity liabilities should be the same percentage growth, so the main factor to limit sales growth rate is the expansion speed of shareholders' equity. Therefore, the calculation model of the sustainable growth rate as follows:

$$\begin{aligned} SGR &= \frac{\Delta E}{E_0} \\ &= \frac{NP \times (1-d)}{E_0} \\ &= \frac{NP}{S} \times \frac{S}{A} \times \frac{A}{E_0} \times (1-d) \end{aligned} \quad (2)$$

In the model:  $A$  refers to assets,  $E_0$  refers to beginning shareholders' equity,  $S$  refers to current income,  $NP$  refers to net income,  $d$  refers to dividend payout ratio,  $\frac{NP}{S}$  refers to net profit margin on sales,  $\frac{S}{A}$  refers to total assets turnover,  $\frac{A}{E_0}$  refers to initial rights total assets multiplier,  $(1-d)$  refers to retained earnings rate,  $SGR$  refers to sustainable growth rate.

#### 4 Sample Selection and Data Sources

The sample that this study needs ranges for the listed companies in Shanghai and Shenzhen Stock Exchange in the steel industry. In order to avoid the negative financial sustainable growth rate calculated because of continuous loss of profits, or the over-high sustainable growth rate because of the wholesale restructuring of the business, during the analysis period companies that have continuously loss or have wholesale business restructuring are not considered. After screening according to the above criteria, there are 33 companies ultimately included in the sample.

In order to test whether a listed company is of sustainable growth, the data usually can be convinced only requires a longer period of time, and general this time should not be less than five years, otherwise the analysis is not of stability in time. To avoid accounting caliber differences, in the empirical analysis this essay selects the period of listed companies in steel industry from the year of 2007 when new accounting standards was implemented to the year of 2010 as the analysis period, which contains sample companies of 2007 to 2010 a total of four years' financial data taken directly from the report of the year, and the data of 2006 is the data of 2006 disclosed in the company annual report in 2007 adjusted according to the new standards. Therefore, this essay's analysis is based on reality and efficiency of the financial data announced by each sample company.

The above financial data comes from the annual financial report of the year from 2007 to 2010 announced by sample companies on Shanghai and Shenzhen Stock Exchange website, the financial data involved mainly includes sales revenue of listed companies, total asset turnover, total Assets at the end of the year, the beginning of rights and interests, cash dividends and net profit margin on sales, etc.

## 5 The Analysis and Result of the Sustainable Growth Model for Listed Companies in the Steel Industry

### 5.1 The calculation results of the sustainable growth rate and the real growth rate

Apply Robert · Higgins' sustainable growth model to calculate the sample companies' sustainable growth rate (SGR) and the real sales growth rate (G), the result is shown in table 1.

**Table 1 The Calculation Results of the Sustainable Growth Rate**

company serial number	2006		2007		2008		2009		2010	
	SGR	G	SGR	G	SGR	G	SGR	G	SGR	G
1	0.0584	0.1227	0.1740	0.5175	0.3791	0.4457	0.0137	-0.3826	0.0097	0.2350
2	1.6285	1.0651	0.8011	0.2056	0.0011	0.2155	0.0027	-0.1192	0.0312	0.3181
3	0.0144	10.3794	0.1301	0.4384	0.0271	0.5664	0.0255	-0.1788	0.1683	0.4384
4	0.2261	-0.0314	0.7950	0.4508	0.0198	0.6481	0.0023	-0.2291	0.0127	0.1920
5	0.1005	0.2463	0.0798	0.2140	0.0390	0.0458	0.0346	-0.2596	0.1010	0.3629
6	2.0421	0.3041	0.0474	0.1737	0.0046	0.2345	0.0175	-0.0802	0.0627	0.2834
7	0.3651	0.0080	0.2448	0.2265	0.0674	0.2698	0.1639	-0.2587	0.2419	0.4193
8	0.0186	0.3366	0.0158	0.0353	0.0104	-0.0521	0.0121	-0.2689	0.0152	0.0893
9	1.6048	1.1554	0.1688	3.2112	0.0006	0.0176	0.0193	-0.1842	0.1707	0.1097
10	0.0081	-0.0794	0.0157	0.1288	0.0221	0.1078	0.0166	-0.2206	0.0191	0.2644
11	0.0031	-0.2438	0.0254	0.1669	0.0043	0.2600	0.0665	-0.1874	0.0015	0.0720
12	0.0102	0.0808	0.0622	0.1104	0.0299	0.2782	0.0243	-0.1009	0.0260	0.1175
13	0.7957	0.2604	0.0506	0.2717	0.0018	0.3550	0.0186	-0.2878	0.0232	0.2354
14	0.1660	0.2357	0.1437	0.2201	0.0037	0.2077	0.0060	-0.2889	0.0126	0.4249
15	0.0994	0.0151	0.1077	0.1771	0.0118	0.2648	0.0872	0.0364	0.1969	0.3523
16	0.3200	0.2111	0.6069	0.2691	0.0136	0.4110	0.0569	-0.0907	0.0531	0.3971
17	0.0900	-0.1188	0.0775	0.2962	0.0791	0.1111	0.0733	-0.2192	0.2551	0.2021
18	0.1056	0.0889	0.1244	0.4306	0.1299	0.4063	0.0176	-0.2722	0.0313	0.2530
19	0.0071	0.0735	0.2417	0.3795	0.0069	0.2886	1.1333	-0.1376	0.0898	0.2291
20	0.0021	0.1220	0.0071	0.2009	0.0117	0.4302	0.0079	0.0349	0.0046	0.0606
21	0.2102	-0.0130	0.4666	0.2892	0.0038	0.5391	0.0091	-0.2313	0.0274	0.1901
22	0.0728	0.1591	0.4145	0.1953	0.0027	0.2772	0.0162	-0.3014	0.0035	0.4110
23	0.0016	0.0461	0.3525	0.1118	0.0028	-0.1028	0.0097	-0.0704	0.0068	0.2246
24	1.4571	0.6819	0.2729	1.0049	0.2142	0.0241	0.0187	-0.1353	0.0445	0.2140
25	0.1005	0.0290	0.0020	0.2608	0.0733	0.3541	0.0141	-0.2676	0.0339	0.4074
26	0.1028	0.3469	0.2684	0.6816	0.1842	0.2091	0.0019	-0.2562	0.0471	0.3597
27	0.1626	0.1898	0.5282	0.2856	0.0068	0.2845	0.0502	-0.2631	0.0135	0.4602
28	0.0675	1.2604	0.4504	2.9453	0.1673	2.6052	0.0119	-0.2031	0.0343	0.6120
29	0.1219	0.0992	0.2352	0.2619	0.3084	0.2847	0.0028	-0.4116	0.0119	0.2099
30	0.2888	0.1188	0.1091	0.2953	0.0471	0.4413	0.9400	0.4146	0.0724	0.2941
31	0.8992	1.9012	0.3391	3.1810	0.4557	-0.1674	0.3446	-0.0994	0.2868	0.6511
32	0.0122	0.0892	0.3129	0.2468	0.0814	0.3698	0.0009	-0.3427	0.0212	0.5306
33	0.0790	0.2131	0.1569	0.5847	1.0153	0.3949	0.0368	0.1546	0.0840	0.0995

### 5.2 The results and discussions of Wilcoxon's signed rank test

#### 5.2.1 Wilcoxon's signed rank test

Wilcoxon's signed rank test is used to test whether two relevant samples come from the same mean overall, or test whether the two relevant samples have the same distribution. This essay regards the sample companies' sustainable growth rate (SGR) and the real sales growth rate (G) as two relevant samples, uses Wilcoxon's signed rank test to make aggregate and annual analysis, and examines whether the sample companies' sustainable growth rate (SGR) is in accordance with the real sales growth rate (G), and whether realize the financial sustainable growth.

Wilcoxon's signed rank test can perform as the following steps:

Assume that the sample contains  $n$  listed companies, according to Higgins' sustainable growth



model, the sustainable growth rate (SGR) and the real sales growth rate (G) are respectively  $X_1, X_2, \dots, X_n$  and  $Y_1, Y_2, \dots, Y_n$ , then

(1) establish null hypothesis alternative hypothesis:

$H_0$ : The sample companies' sustainable growth rate (SGR) and the real sales growth rate (G) have no significant difference, that is,  $X_1, X_2, \dots, X_n$  and  $Y_1, Y_2, \dots, Y_n$  have no significant difference;

$H_1$ : The sample companies' sustainable growth rate (SGR) and the real sales growth rate (G) have significant difference, that is,  $X_1, X_2, \dots, X_n$  and  $Y_1, Y_2, \dots, Y_n$  have significant difference.

(2) Calculate the difference of positive and negative.  $D = X_i - Y_i (i = 1, 2, 3, \dots, n)$

(3) make the difference absolute value, arrange in numerical order and make the level, that is, determine the sequence number. For the adjacent equivalent, then take its average of sequence number as the level.

(4) restore the original positive and negative sign of the difference of each level, plus the level of positive and negative sign respectively presented with  $T^+$  and  $T^-$ , and take the smaller value  $T$  for the test statistic.

(5) Make sure the total number  $n$  of deference with plus sign or negative sign. If the difference of a matching observation is zero, it should be distinguished and the sample size  $n$  should be correspondingly reduced.

(6) In the significance level  $\alpha$  check the standard normal distribution  $\alpha/2$  quantile  $Z_{\alpha/2}$ .

When  $|Z| > Z_{\alpha/2}$ , reject the null hypothesis  $H_0$  that there are significant differences between the sustainable growth rate (SGR) and the real sales growth rate (G) of listed companies; otherwise there is no sufficient reason to reject the null hypothesis  $H_0$  that there are no significant differences.

5.2.1 The results of Wilcoxon's signed rank test

(1) the overall condition analysis of the sustainable growth of the samples

Make use of SPSS software to test listed companies' real growth rate and sustainable growth rate for five years by Wilcoxon's signed rank test, the result is shown in Table 2:

**Table 2 The Result of Wilcoxon' Signed Rank Test of the Samples' Sustainable Growth**

		N	Average of ranks	Sum of ranks
G-SGR	Negative rank	65	83.15	5405.00
	Positive rank	100	82.90	8290.00
	sum	165		
$Z$			-2.347	
Asymptotic significant (bilateral) $\alpha$			0.019	

From the result of Wilcoxon's signed rank test, the sustainable growth rate and the real sales growth rate of 33 listed companies of China's steel industry from 2006 to 2010 are not accordant, so the samples are not to achieve sustainable growth. In the five years, most part of the companies' growth speed exceeds the sustainable growth rate, which reflects most listed companies in steel industry are in the state of growth rapid and capital devoted insufficient.

(2) The test result and analysis of the year level of the samples' sustainable growth situation

Make use of SPSS software to test listed companies' real growth rate and sustainable growth rate of every year by Wilcoxon's signed rank test, the result is shown in Table 3:

It can be seen from the test results that during the process of development from 2006 to 2010 of the listed companies in steel industry, the year of 2006 basically remained the sustainable growth; the result of 2007 is not significant that can not clearly determine whether the real growth rate and the sustainable growth speed are accordant; in the year of 2008, 2009 and 2010 the real growth rate and the sustainable growth speed are not accordant. The value of  $|Z|$  increases year by year from 2006 to 2010, which suggests that the listed companies in steel industry do not achieve sustainable growth and the real

growth rate, has made increasing deviation with the sustainable growth rate in five years. It can be seen from the phenomenon that in today's modern enterprise system of continual establishment and perfection of listed companies in steel industry, the problem of sustainable growth has not been taken seriously by the companies, the concept of sustainable growth has not been in the depth mind of the companies' executives and popularize the concept of sustainable growth is a long way to go.

**Table 3 The Test Result of the Year Level of the Samples' Sustainable Growth Situation**

	2006	2007	2008	2009	2010
Negative rank	17	10	6	30	2
Positive rank	16	23	27	3	31
Z	-0.456	-1.706	-3.529	-4.815	-4.923
$\alpha$	0.649	0.088	0.000	0.000	0.000

### 5.3 The summary

The above empirical results show that:

(1) Generally speaking, the whole listed companies in steel industry do not achieve sustainable growth that 60.61% of the companies are in the state of excessive growth and the others are in the state of insufficient growth.

(2) From the analysis of each year, listed companies in steel industry of China didn't achieve sustainable growth and fluctuated seriously in the last three years. Due to the influence of the world economy's rapid development before 2007, the majority of the samples about 81.8% were in the high-speed growth state in 2008; because of the tremendous impact of steel industry suffered from the global economic crisis, 90.9% of the samples were in the insufficient growth state in 2009; due to the support on the steel industry by the Chinese government in 2010, 93.9% of the samples were in the excessive growth state. It shows that Chinese listed companies in steel industry are still in the blind follow state, generally lack of sufficient attention for the sustainable growth concept and do not adopt the sustainable growth theory to the management of companies' growth.

In a word, it can be seen from the above empirical results that whether the general situation for five years or the year of listed companies in steel industry, the sustainable growth is not positive that it did not only achieve the sustainable growth, but has made increasing deviation with the sustainable growth standard.

## 6 Conclusion

By using Robert · Higgins' sustainable growth model and Wilcoxon' signed rank test, this essay analyzed and discussed the real growth rate and the sustainable growth rate of listed companies in Chinese steel industry between 2006-2010, and found that listed companies in Chinese steel industry did not achieve sustainable growth because they made too fast growth in most years, which has influenced the healthy development of Chinese steel industry. To some degree, it also indicates that listed companies in Chinese steel industry did not carry out effective managements for financial sustainable growth.

The above research results show that even though Chinese steel industry developed rapidly and have made great achievements, they consumed tremendous energy and resources, and affected the sustainable development of industry. The expansion speed of steel industry was very fast, and the increasing expansion of the industry mainly relied on extensive growth mode merely pursuing the increase of quantity, which is not desirable. At present, the price of raw material in Chinese steel industry stays at a high level. The price of steel is depressed and the profits of steel companies are meager, so it is urgent to find a kind of sustainable growth model.

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# A Research on Forewarning Appraisal of Urban Carrying Capacity Based on Complex System Vulnerability\*

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**Abstract:** With the development of the urbanization and the industrialization, all kinds of disasters often happen to the big urban. This made the vulnerability of the urban stronger and stronger. Due to the population concentrating in the city and the flourishing economy, the sudden disaster affairs usually bring the graveness loss. Therefore, the research on the vulnerability problem of the urban became more and more important. Based on above, the paper aimed to research on the vulnerability of the urban. Firstly, the paper indicated the importance of the research on the urban carrying capacity vulnerability. Secondly, the paper reviewed the relevant literature of the urban carrying capacity vulnerability. Thirdly, the paper illustrated the definition and the expression of the urban carrying capacity vulnerability. Fourthly, the paper put forth the appraisal framework of the urban carrying capacity vulnerability. Fifthly, the paper designed the forewarning appraisal system of the urban carrying capacity vulnerability.

**Key word:** Complex System Vulnerability; Urban Carrying Capacity; Forewarning Appraisal

## 1 Introduction

With the development of the urbanization, the sudden affair often took place in the urban, and the urban carrying capacity vulnerability became more and more obvious. Because the population and the economy concentrate in the urban, the disasters usually brought the urban the graveness loss. Therefore, the research on the vulnerability of the urban carrying capacity became more and more important. Now the research on the vulnerability not only broke through the natural system but also the social field. What's more, World Economic Forum began to list the reducing vulnerability as one of the six big threats in the word from 2002. Though the vulnerability is a new project in the academic research field, the research on the vulnerability of the urban carrying capacity still remains to be a whole system. As we all know, the research on the vulnerability of the urban carrying capacity can be helpful to find the urban vulnerability, to adopt the countermeasures to reduce the vulnerability, to strengthen the urban carrying capacity, and to avoid the risk and the loss of the disasters. Based on above, the paper aimed to research on the vulnerability of the urban. Firstly, the paper introduced the importance and the content of the research on the urban carrying capacity vulnerability. Secondly, the paper reviewed the relevant literature of the urban carrying capacity vulnerability. Thirdly, the paper illustrated the definition and the expression of the urban carrying capacity vulnerability. Fourthly, the paper put forth the appraisal framework of the urban carrying capacity vulnerability. Fifthly, the paper designed the forewarning appraisal system of the urban carrying capacity vulnerability.

## 2 Relevant Literature Review of Urban Carrying Capacity Vulnerability

The vulnerability is usually defined as the possibility, the degree or the status that the system is easy to be injured. However, the definitions of the vulnerability are different in different fields, objects and aspects. Only if learning about the relevant literature, we can grasp the essence of the urban carrying capacity vulnerability.

The concept of the vulnerability originated from 1970s. Phil O'keefe(1976) put forth that the disaster is a never natural outcome, but result from the weak link of the social system. UNDR0(1982) defined that the vulnerability is the losing degree when some factor or system suffer from some strength natural phenomena. Bohle(1989)indicated that the vulnerability of the social system is the comprehensive measurement to the mankind's social welfare, and the defense ability to cope with a series of latent harm. Fenghui Wang(1989) advanced that the eco-environment vulnerability is deteriorate degree the degree of the environment when the mankind activity exceed its acceptance ability and flexibility limit. Downing(1991) put forward that the vulnerability means the result of a kind of disadvantage but isn't a kind of cause. B.Kochunov(1993) indicated that the vulnerability of the different eco-system is relevant to its dynamic function process closely. If being subjected to a

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perturbation, the normal function of the system will be disrupted, the system starts heading for vulnerability when losing its instauration ability. From 1990s, University of South Carolina established Hazards & Vulnerability Research Institute to research on the vulnerability index. UNU-EHS hold the annual lecture of the social vulnerability from 2006.

Recently, the concept of the vulnerability continuously evolves and mainly points to the ability system to resist reply and resume when the mankind society being subjected to the disaster. Jinsong Zhou(1997) put forth that the vulnerability of the eco-system means the ability of an eco-system easily evolves from a kind of status to another status and then turn back to the original status again under the certain mechanism function. Yanrui Shang indicated that vulnerability means the quality of being easily subjected to property of the injury and loss when some particular loading body to a certain natural disaster under certain society, economy and cultural background<sup>[1]</sup>. Xiaohong Yu etc (2007) illustrated the urban vulnerability in the ecosystem, the environment, the interpersonal relation, resource and the security etc, and put forth the countermeasures [2]. Lei Jin (2008) indicated the vulnerability problems in the urban eco-environment, the disasters, and the infrastructure and so on [3]. Yingying Yu(2011) advanced that the vulnerability means that the ability of the system to defense, cope with and restore from the disasters from the sudden affair[4]. The concept of the vulnerability includes three objects such as the carrying object, the disaster and their relations. The carrying object is the impacted and damaged part of the city being subjected to the sudden affairs. The disaster means the reason resulting in the damage and the impact. The relations are the ability to defend and restore when being faced with the disasters.

According to the literatures, we can lean that the scholar from the natural science define vulnerability usually from the environment, and their research object is mainly a natural eco-system; The scholar from the social science pays attention to the vulnerability in the political, economy and society aspects. Their research object is mainly a humanities system.

### **3 Definitions and Contents of Urban Carrying Capacity Vulnerability**

#### **3.1 The Definition of the Urban Carrying Capacity Vulnerability**

Though the research objects are different in different subjects, all of them will bring the reference to the research on the urban carrying capacity<sup>[5]</sup>. The urban carrying capacity is an open system. If we want to keep it in a good status, the urban government needs to cope with all kinds of disturbance from the internal and external. Therefore, we should adopt the system standpoint to research on it, but can't split it into different isolated pieces.

Based on above researches and the definition of the urban carrying capacity, the paper put forth that the urban carrying capacity vulnerability means the sensitivity to the outside and inside perturbation because of the bad development ability, and the status to the disadvantage due to be deficient in the ability to cope with the disturbance when the external condition are disadvantage. The urban carrying capacity vulnerability is a gifted attribute, and it will be found when the urban carrying capacity is be disturbed. Therefore, the internal characteristics of the urban carrying capacity are the direct reason of the vulnerability. The disturbance and the mutual action are the drive factors of the urban carrying capacity vulnerability.

When the urban carrying capacity vulnerability is accumulated into a certain degree, it will make the urban head for a negative direction. If we can't suppress the negative trend, the sustainable development of the urban carrying capacity will sink into the stagnation and even the collapses. The factors result in the urban carrying capacity vulnerability come from not only itself but also the natural and social system. When the vulnerability is higher, the governments have to reduce and control it with the policy and the market<sup>[6]</sup>.

#### **3.2 The Content of the Urban Carrying Capacity Vulnerability**

The urban carrying capacity is a complex system, its vulnerability result from not only the natural reason but also the artificial<sup>[7]</sup>. Therefore, The content of the urban carrying capacity vulnerability includes itself vulnerability, the environment vulnerability, the relation vulnerability, the resource vulnerability and the security vulnerability and so on<sup>[8]</sup>.

The first is the system vulnerability in itself. The urban carrying capacity is a vulnerable system in itself firstly. This system needs the material and resource input from the external, at the same time it is necessary to output a lot of waste, so it depend on the artificial material transporting system. However, once something's wrong with any link of the transporting system, the urban normal function will be affected. Secondly, the natural regulation mechanism will malfunction in the urban carrying

capacity system. The concentration of the population, material, resource and other artificial factors destroyed the natural regulation mechanism of the urban carrying capacity system. Thus these factors aggravated the vulnerability of the urban carrying capacity. Finally, the food chain simplification of the urban carrying capacity system made the self-regulation ability worse and worse. Due to the reduction of the urban species diversity, the mode and way of the energy flow and the material recycle all changed, the relationship between the urban carrying capacity system and the ecosystem is inverse, so the urban self-regulation ability is worse and worse.

The second is the external environment vulnerability. With the intensification of the urbanization, the urban environment become more and more serious, the pollution is more serious in the air, the water, the waste and the sound and so on. The content of harmful substances in the air is from double to eight times of the maximum limit in WHO. More than 70% of the cities distributed along with the rivers and lakes, 80% of their river are not suitable as a source of drinking water. More than 50% of the urban groundwater is contaminated. The urban annually produces 0.1 billion tons of garbage and the waste are increasing by 10% annually, at least 2/3 urban are surrounded by the garbage<sup>[9]</sup>.

The third is the vulnerability of the social relation. With the urbanization development, there occur the serious problems in the social relationship. The idea and the behavior criterion of the residents have undergone the major changes. The traditional social relationships encountered hitherto unknown challenge. The neighborhood interpersonal relationship become gradually alienated indifference and apathy. Therefore, the illegal crime is increasing, the prevalence odds of the autism and depression increase<sup>[10]</sup>.

The fourth is the urban resource vulnerability. The urban development needs a lot of material and energy that must be input from the external. The larger the urban scale is the more of the material and energy input needs and the stronger the degree of depending on the external is. With the development of the city and the energy consumption increasing, the urban resource vulnerability becomes more and more prominent. Now the dependence of the national energy foreign is nearly 50%.

The final is the security vulnerability. The reason for the security vulnerability includes natural and artificial aspects. The natural factors resulting in the safety problems include the earthquake, the tsunami, the mud flow, the landslide, the collapse and other geological and meteorological disaster. The anthropogenic causes the city security including the war, the terror, and the large construction threats and so on. The peace and development have become the main theme of the times, but the world is not peaceful. The modern city as the focus of social wealth has become a preferred place of the war and the attack targets.

#### **4 Conceiving of Mutual Action Forewarning Appraisal Framework of Urban Carrying Capacity Vulnerability**

The urban may face unexpected events in various forms, not only the natural disasters such as the earthquake and flood and so on, but also the artificial affairs such as the traffic accident, the leakage of dangerous goods, and the industrial poisoning. The outcome of the disasters is relevant not only to the carrying factors but also to the urban carrying capacity vulnerability. The stronger the vulnerability is under the same sudden affair, the more serious the loss of the urban is. In some extent, the vulnerability is the relationship between the carrying object and the carrying subject. That is, the carrying capacity vulnerability is the relationship among the carrying pressure, the support ability and their coordination ability.

The carrying pressure is the status that the carrying objects support the social and economic activity. The more the carrying pressure is, the stronger the carrying capacity vulnerability is. The support ability is the maximum that the carrying object can support the social and economic activity. The stronger the support ability is, the worse the carrying capacity vulnerability is. The coordination ability is that the government copes with the unbalance between the carrying pressures and the support ability. The stronger the coordination ability is, the more quickly the urban carrying capacity restore, the worse the vulnerability is<sup>[9]</sup>.

According to the characteristics and the mutual relationships of the pressure, the support and the coordination, the paper put forth the mutual action forewarning appraisal framework of the urban carrying capacity, which is shown in Fig.1. The urban carrying capacity vulnerability includes the mutual action relationship and process among the pressure, the support and the coordination.

According to Fig.1, the forewarning appraisal framework of the urban carrying capacity vulnerability includes the carrying pressure, the support ability and the coordination ability. The driving

factors can combine the three concepts. No driving factors, the environment won't change, there won't be the disturbance. Though there exists the vulnerability, it won't bring any loss to the carrying capacity. Therefore, the support ability is that the urban carrying capacity resist to the disturbance, the coordination ability is that the system restores its origin status with the resource allocation. Based on above, we can conclude that the carrying pressure is positive relevant to the vulnerability, the support and the coordination ability are helpful to reduce the vulnerability.

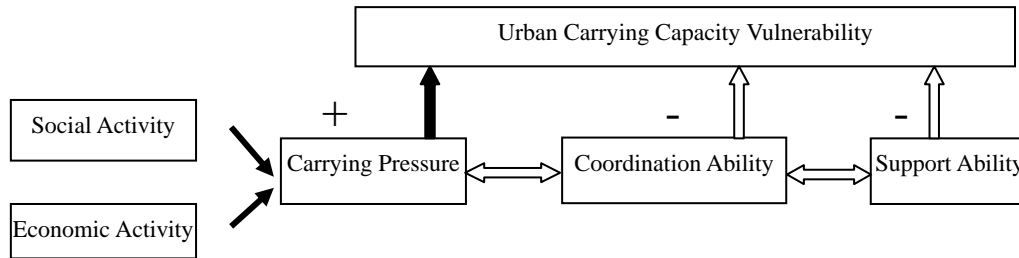


Figure 1 The Forewarning Appraisal Framework of the Urban Carrying Capacity Vulnerability

### 5 Designing of Forewarning Appraisal System of Urban Carrying Capacity Vulnerability

The forewarning appraisal system of the urban carrying capacity vulnerability consists of the pressure, the support ability and the coordination [10].

#### 5.1 The pressure indicator of the urban carrying capacity vulnerability

The pressure includes three aspects such as the social system, the economic system and the eco-environment system. Firstly, the social system indicator responds the pressure, the dynamic change and the comprehensive exploration status of the population to the urban [11]. Secondly, the economic system indicator responds the pressure status, the dynamic change and the structure status. Finally, the eco-environment system indicator responds the water consumption, the pollution and the green land. The specific indicators are shown as Table 1.

Table 1 The Pressure Index of the Urban Carrying Capacity

Objective Level	Rule Level	Indicator Level	Indicator Criteria
Social System Pressure	Population Number and Structure	Population Growth Rate	Similar
		Population Density	Similar
		Urban Population Ratio	State
	Residential Environment	Per Capita Green Area	Similar
		Per Capita Forest Coverage	Similar
	Housing Land	Per Capita Living Space	Similar
	Infrastructure	Per Capita Road Land Area	Similar
		Per Capita Sports Infrastructure Investment	Similar
		Per Capita Hospital Bed	Similar
		Communication Popular Rate	Similar
Residential Water Consumption	Per Capita Annual Residential Water Consumption	International	
Residential Energy Consumption	Per Capita Annual Residential Energy Consumption	Similar	
Social Development Level	Per Capita GDP/ GDP <sub>max</sub>	International	
Economic System Pressure	Economic Scale and Structure	Per capita GDP	Similar
		GDP Growth Rate	Similar
		First Industry Ratio	Similar
	Industrial Environment	Waste Water / GDP	Similar

		Waste Gas/ GDP	Similar
		Solid Waste/ GDP	Similar
	Industrial Land	Land Consumption/ GDP	Similar
	Industrial Infrastructure	Infrastructure Investment/GDP	Similar
	Industrial Water Consumption	Water Consumption/GDP	Similar
	Industrial Energy Consumption	Energy Consumption/GDP	Similar
<b>Environmental System Pressure</b>	Eco-environmental Land Consumption	Eco-environmental Land Consumption Rate	Similar
	Eco-infrastructure Investment	Eco-infrastructure Investment Rate	Similar
	Eco-water Consumption	Eco-water Consumption Rate	Similar
	Eco-energy Consumption	Eco-energy Consumption Rate	Similar
	Eco-environment Quality	Water Comprehensive Pollution Index Forest Coverage Rate Land Pollution Rate	Similar

**5.2 The support ability indicator of the urban carrying capacity vulnerability**

The support indicator measures the quality, the quantity and the exploitability of the urban carrying factors [12]. The specific indicators are shown as Table 2.

**Table 2 The Support Index of the Urban Carrying Capacity**

Objective Level	Rule Level	Indicator Level	Indicator Criteria
Environmental Support	Environmental Resource	Environmental Capacity Index	Similar
	Environmental Exploitation	Waste Air Attainment <u>Rate</u>	State
		Waste Water Attainment <u>Rate</u>	State
		Solid Waste Handling Rate	State
Land Support	Land Resource	Land Resource	Similar
		Land Exploitation Rate	Similar
Water Support	Water Resource	Unit Area Water	Similar
		Water Exploitation Rate	Similar
Energy Support	Energy Supply	Per Capita Annual Energy Supply	Similar

**5.3 The coordination indicator of the urban carrying capacity vulnerability**

The coordination system not only responds the impacts of the carrying factors change on the society, the economy and the environment, but also expresses the total coordination status. The specific indicators are shown as Table 3.

**Table 3 The Coordination Index of the Urban Carrying Capacity**

Objective Level	Rule Level	Indicator Level	Indicator Criteria
<b>Urban Cooperation Appraisal Indicators</b>	Total Cooperation Indicators	Supply and Demand Equilibrium Index	Similar
	Resource and Society	Per Capita Land Area	Similar
		Per Capita Water Resource	Similar
		Per Capita Energy	State
Resource and Economy	Resource and Economy	Residential Waste Water Exhausts Rate	State
		Water Consumption / GDP	Similar
		Land Consumption / GDP	Similar
		Energy Consumption / GDP	Similar
Resource and Eco-system	Resource and Eco-system	Industrial Waste Water Exhausts Rate	International
		Ecosystem Water Shortage Rate	State
		Industrial Waste Water Mark Rate	State
		Waste Water Recycle Rate	State



## 6 Conclusions

Based on above, we can get the follow conclusions. Firstly, the research on the vulnerability of the urban carrying capacity can be helpful to find the urban vulnerability, to adopt the countermeasures to reduce the vulnerability, to strengthen the urban carrying capacity, and to avoid the risk and the loss of the disasters. Secondly, the vulnerability is usually defined as the possibility, the degree or the status that the system is easy to be injured. Thirdly, the content of the urban carrying capacity vulnerability includes itself vulnerability, the environment vulnerability, the relation vulnerability, the resource vulnerability and the security vulnerability and so on. Fourthly, the urban carrying capacity vulnerability includes the mutual action relationship and process among the pressure, the support and the coordination. Fifthly, the forewarning appraisal system of the urban carrying capacity vulnerability consists of the pressure indicator, the support ability indicator and the coordination indicator.

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# Research on Coordination Support Mechanism of Urban Carrying Capacity\*

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**Abstract:** With the development of the urbanization, the population and the urban scale grew dramatically. The urban carrying capacity is faced with the serious threats. Based on this, the paper firstly indicated the importance of the research on the support mechanism of the urban carrying capacity. Secondly, the paper defined the structural model, the subsystem and the factors of the urban carrying capacity system and indicated their effects. Thirdly, the paper analyzed the content and the framework of the urban carrying capacity coordination system, which includes the structural, the functional, the target, the management, and the internal and external coordination. Fourthly, the paper conceived the support mechanisms of the urban carrying capacity system, which includes the constraint mechanism of the resource and environment, the support mechanism of the science and technology development, the cluster and spread mechanism of the factors and products, the driving mechanism of the industrial upgrading, the innovation mechanism of the policy and the guiding mechanism of the plan. Finally, the paper concluded the research on the coordination support mechanism of the carrying capacity.

**Key word:** Urban Carrying Capacity; Coordination Framework; Support Mechanism

## 1 Introduction

With the development of the urbanization and the industrialization, the urban population and scale are enlarged quickly. The carrying capacity began to restrict the urban development gradually<sup>[1]</sup>. It becomes more and more important to coordinate the relationship between the urban sustainable development and the constraints of the urban carrying capacity. It is relevant to not only the future sustainable development of the urban but also the peripheral region<sup>[2]</sup>. Therefore, the paper aimed to define the structural model, analyze the coordination framework and design the support mechanism of the urban carrying capacity to provide the reference to the urban management. The content of the paper can be concluded the follow. Firstly, the paper indicated the importance of the research on the support mechanism of the urban carrying capacity. Secondly, the paper defined the structural model, the subsystem and the factors of the urban carrying capacity system and indicated their effects. Thirdly, the paper analyzed the content and the framework of the urban carrying capacity coordination system, which includes the structural, the functional, the target, the management, and the internal and external coordination. Fourthly, the paper conceived the support mechanisms of the urban carrying capacity system, which includes the constraint mechanism of the resource and environment, the support mechanism of the science and technology development, the cluster and spread mechanism of the factors and products, the driving mechanism of the industrial upgrading, the innovation mechanism of the policy and the guiding mechanism of the plan. Finally, the paper concluded the research on the coordination support mechanism of the carrying capacity.

## 2 Structural Model Definition of Urban Carrying Capacity

The urban carrying capacity system included the hardware carrying capacity system, the software carrying capacity system, the combination system and the expression system<sup>[3]</sup>.

### 2.1 The hardware carrying capacity system

The hardware carrying capacity system includes the carrying capacity of the environment, the infrastructure, the water and the energy and so on. Firstly, the urban environment is the indispensable condition of the social and economic activities. It will make impact on the cost and effectiveness of the urban industries directly. Therefore, if there are not the environmental supports, the city won't develop. Secondly, the scarcity of the urban land make the exploitation improve or restraint the development of the industries. The land exploitation in the city is the indispensable precondition of the urban consumption. It directly influences the external cluster economic effects. The structure of the land exploitation in the city also makes effects on the industrial structure and the distribution<sup>[4]</sup>. Thirdly, the

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urban infrastructure is the foundation of the social and economic activities, the key of the industrial development, decide on the utility of the urban function, influence the liquidity of material, the capital the information and the talent. At the same time, it directly influence the opposite cost of the urban industry development. Fourthly, the energy is the blood of the urban social activities and economic activities. If there is not the support of the energy, the urban industry won't realize the sustainable development. Finally, the water is the necessity of the urban life and production. It not only decides on the industrial structure in the city, but also influences the different development of the urban industry. Therefore, the hardware carrying capacity system decides on the total performance of the urban carrying capacity.

**2.2 The software carrying capacity system**

The software carrying capacity system includes the carrying capacity of the culture, the policy, the management, the technology, the learning and the opening. Firstly, the culture is the non-formal system arrangement, and the special citizen society consciousness, moral concept and city cultural atmosphere and customs etc. These factors make effect on the behavior method of the citizen and influence the exertion of hardware carrying capacity. Secondly, the policy is the allocation system of the resources in the city. The government change the trade cost and the use cost of the urban hardware through the system and the policy in order to regulate the urban carrying capacity. Thirdly, the management means the development strategy, the management tactics, the management level, the management efficiency, the management means and the management measures. All these will influence the efficiency of the urban hardware and the sustainable development of the city. Fourthly, the science and technology is productivity, the double effect reactor of the urban resources, one of the factors with vitality. The science and technology is able to produce the double carrying capacity through integrating with the urban hardware. So it is the decisive motivation of the urban carrying capacity. Fifthly, the learning means absorbing the successful experience of other cities through exchanging with them to improve the urban hardware carrying capacity. Finally, the opening is that the city is open to learn the culture, the system, the management, the technology and on of other cities in order to enhance the urban carrying capacity. The more open the city is, the higher the software carrying capacity is, and the easier the urban makes full use of the hardware. However, the software can't influence the urban carrying capacity independently, it have to depend on synthesizing with the hardware.

**2.3 The combination system**

The combination system responds the condition of the combination between the hardware and the software. The urban carrying capacity expresses its action only through the combination of the different industries in the urban. So the combination carrying capacity is namely the industry carrying capacity. The industry is the gathering source of the urban resources, a convertor change the resource into the product and service, and the radiation source that the product and service head for the world. Therefore, the reasonably development of the industry is the foundation of the urban social and economic activities. If there isn't the development of the industry, there is not the urban carrying capacity.

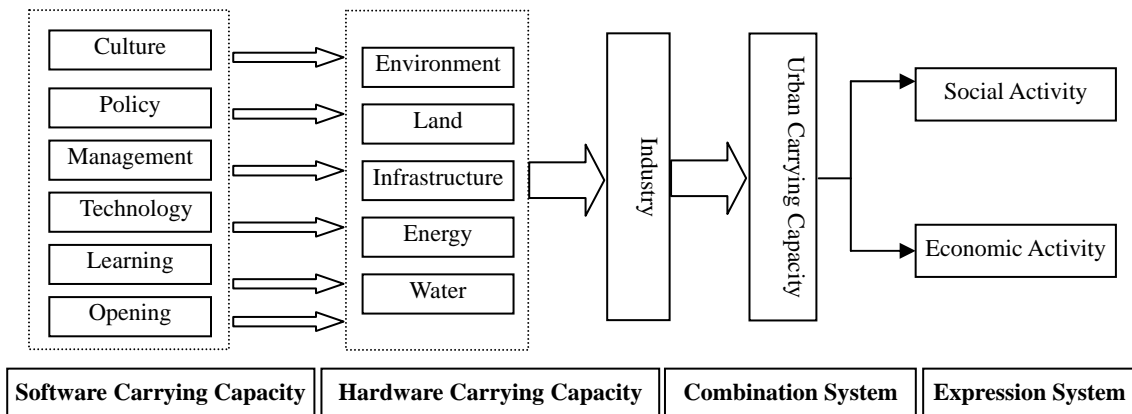


Figure 1 The Structural Model of the Urban Carrying Capacity System

**2.4 The combination system**

The urban social and economic activities are the specific expression and the target of the urban carrying capacity. The specific indicators relevant to the social and economic activities can respond the urban carrying capacity. The humankind is the corpuses of the production and life in the cities. The

living standard will have the mutual influence with the carrying capacity. In different stage, the living standard is different, and the demand to the urban hardware and software is different. So the urban carrying capacity is different.

Therefore, all the subsystem informs the urban carrying capacity through mutual action with each other. This is shown in Figure1.

### 3 Coordination Frameworks Conceiving of Urban Carrying Capacity

#### 3.1 The Definition of the Urban Carrying Capacity Coordination

The coordination means the consociation function or collective behavior that the sub-systems are in conjunction with each other through the mutual Moderation, cooperation and synchronous. The coordination of the urban carrying capacity is the relationships of cooperation among its subsystems and factors, and the structure and status of the urban carrying capacity resulting from the relations. These relations are not fixed constantly, but dynamic coordination. Only if the governments want to realize the coordination of the urban carrying capacity, they must learn about the needed relations among the subsystems and factors in order to obtain their objects.

#### 3.2 The Frameworks of the Urban Carrying Capacity Coordination

If the governments want to realize the coordination of the urban carrying capacity, it is necessary to conceive the coordination framework through regulating the subsystems and factors. According to the content of the urban carrying capacity, the paper put forth the coordination framework of the urban carrying capacity that is shown as Figure2.

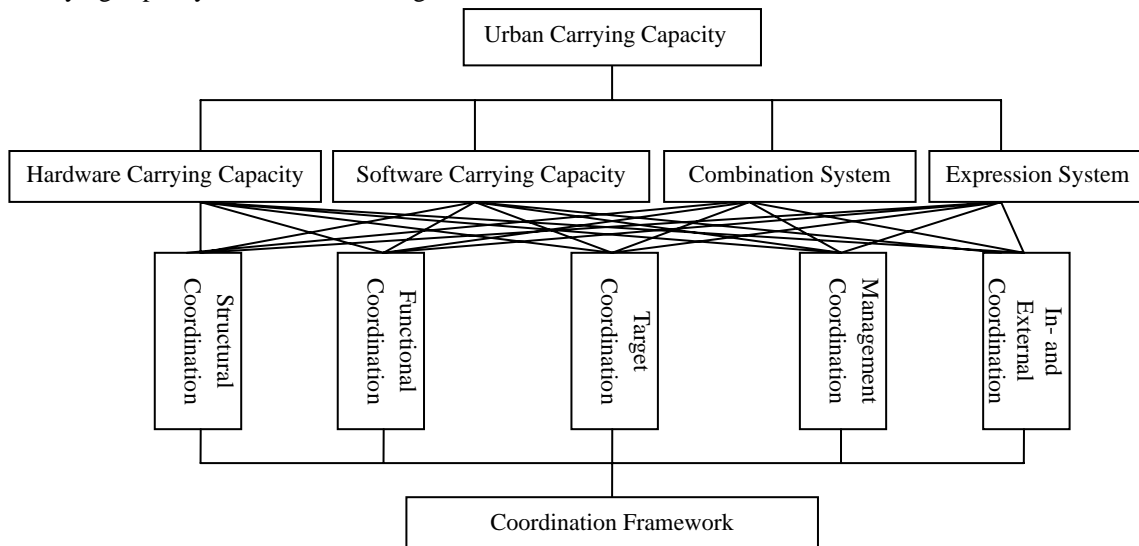


Figure 2 The Coordination Framework of the Urban Carrying Capacity

The coordination content of the urban carrying capacity includes the coordination of the structural, the functional, the target, the management and internal and external. The structural coordination reflects the mutual combination, mutual permeation, mutual constraint, mutual promotion and mutual connection among the system and its factors, their actions and structure are reasonable. So the structural coordination is the basic for the normal operation of the urban carrying capacity. The functional coordination is the concrete performance of the total coordination in the whole system of the urban carrying capacity. The urban carrying capacity system will obtain the excellent function through the combination of the subsystems and factors. The target coordination is the performance and purpose of the system coordination. It makes the total objects realized through coordinating the system target and the subsystem objects with the various feedback control mechanism of the complicated system. The management coordination responds the consistency of all kinds of management systems, methods, measures and means, and the management orientation consists with the system target. The internal and external coordination reflects the self-regulation mechanism adapting to the internal and external environment. The urban carrying capacity realizes the evolution through this kind of coordination.

The urban carrying capacity is an open system consisting of many subsystems with reasonable structure

and function <sup>[5]</sup>. The coordination of the urban carrying capacity needs the continuous recycle from the diagnose, the moderation, to the evaluation.

## **4 Support Mechanism Designing of Urban Carrying Capacity**

The urban carrying capacity reflects the mutual action of all kinds of factors from the internal and external. The normal operation of the urban carrying capacity needs the support of them. In the whole, the reasons resulting in the dynamic change of the urban carrying capacity include the resource and environmental mechanism, the technology development mechanism, the factor clustering and product spreading mechanism, the industrial upgrading mechanism, and the policy and plan guiding mechanism.

### **4.1 Resource and environmental constraint mechanism**

The resource and environmental constraint mechanism includes two aspects such as the natural environment and the resource gift. Firstly, the natural environment is the natural foundation of the urban, and also the natural power of the urban carrying capacity. Generally speaking, the distribution of the natural condition directly influences the urban carrying capacity. The function path of the natural environment to the urban carrying capacity mainly influences the space distribution of the industry. The natural condition influence the space distribution of the life and production such as the sunlight, the water, the soil...etc. the condition of the geography and the weather affect the distribution of the industry. At the same time, the space distribution of the urban industry will improve the clustering and the spreading of the social and economic activities. All these will influence the exertion of the urban carrying capacity. Secondly, the resource gift is the material foundation and the precondition of the urban development. At the same time, the regional distribution of the resource affects the urban carrying capacity. Such factors will enhance the urban carrying capacity as the wide distribution of the resource, the better resource combination, the excellent location and the perfect transportation condition <sup>[6]</sup>.

### **4.2 Support mechanism of technology development**

The technology development is very important to support the urban carrying capacity. The support mechanism of the technology development includes two aspects such as the traffic technology and information technology. Firstly, the traffic technology can change the direction of the urban space development. The contact relation and the function of the space will influence the space structure of the city, which depend on the traffic technology innovation. Secondly, the information technology accelerates the communication efficiency of the organization and the people. At the same time, it reduces their trade cost and communication cost. It makes the space relation attractive and convenient, and enhances the social and economic activities. All these will strengthen the total effect of the urban carrying capacity <sup>[7]</sup>.

### **4.3 Factor clustering and product spreading mechanism**

The formation and development of the urban carrying capacity is a kind of the complicated process with the integration among the social, economic and cultural activities. The urban carrying capacity is influenced by the clustering and spreading mechanism. The clustering and spreading process of the factor and product is the formation and development process of the urban carrying capacity. It will also affect the total function of the urban carrying capacity. Therefore, the clustering and spreading of the factor and product will result in the change of the space gravity center in the city. When the urban clustering enter into the uneconomic stage, it means that something wrong with the urban carrying capacity. The spreading will become more and more important at that time. With the strengthening of the urban clustering and spreading, the factors such as the capital, technology and information and so on will fluid reasonably in the urban space. At the same time, the urban carrying capacity will be enhanced.

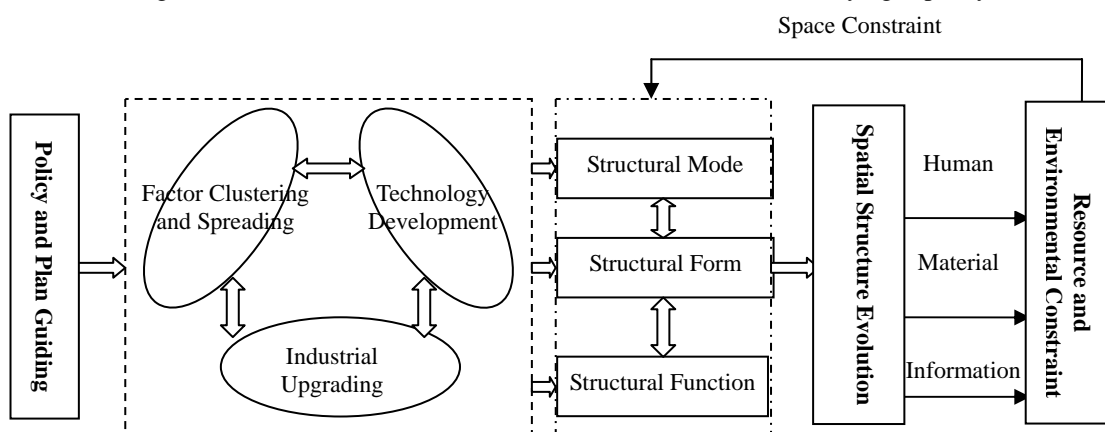
### **4.4 Driving mechanism of industrial upgrading**

The speed, scale and the way of the industry economy directly influence the development of the urban carrying capacity. So the industrial upgrading is the direct driving power of the urban carrying capacity development. The industrial integration will improve the cluster and scale effect of the industry, and enhance the structural and functional optimization of the urban carrying capacity. The industrial knowledge will establish the mutual dependence relation in the city, form the industrial chain, and enhance the structural optimization of the urban carrying capacity. Therefore, the industrial upgrading enlarges the spreading scope of the central city, and strengthens the reasonable distribution of the urban carrying capacity <sup>[8]</sup>.

### **4.5 Policy and plan guiding mechanism**

The formation and development of the urban carrying capacity depend on the regulation of the government. The government can ensure the reasonable liquidity of all kinds of factors through the

policy and system in order to keep the normal operation of the urban carrying capacity. The urban system innovation will accelerate the flowing of the factors among the different regions in the city, and optimize the factors distribution among the different space unit. The combination between the system and the culture will be helpful to the exploitation and application of the urban carrying capacity. Though the formation and development of the urban carrying capacity is a self-evolution process, it depend on the artificial regulate and introduction. The distribution and regulation of the urban carrying capacity is realized through the urban plan and management. The plan should pay more attention to guide the combination between centralization and decentralization. It also coordinates the industrial distribution in different region to ensure the reasonable function structure of the urban carrying capacity<sup>[9]</sup>.



**Figure 3 The Support Mechanism of the Urban Carrying Capacity**

According to the analysis, the formation and development of the urban carrying capacity is the result of the mutual action among the above factors. The coordination support mechanism of the urban carrying capacity is shown as Figure3.

## 5 Conclusions

According to the research, we can conclude the follows. Firstly, it becomes more and more important to coordinate the relationship between the urban sustainable development and the constraints of the urban carrying capacity. Secondly, the system model of the urban carrying capacity includes the hardware carrying capacity, the software carrying capacity, the combination system and the expression system. Thirdly, the coordination content of the urban carrying capacity includes the structural, the functional, the target, and the management, the internal and external coordination. Finally, the normal operation of the urban carrying capacity needs the support of the resource and environmental mechanism, the technology development mechanism, the factor clustering and product spreading mechanism, the industrial upgrading mechanism, and the policy and plan guiding mechanism.

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## Environmental Accounting and GDP in China And India

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**Abstract:** Environment is a rich heritage handed over by previous generations. However the nature's stragglng behind the economic development creates a chaotic atmosphere. Accountants are justifiably among those who might be criticized for this chaos because accounting which is the language business has never spoken for nature and environment except for the recent decades. The author tries to make the tragedy of environmental degradation More palpable through the numbers and accounting for senior managers and other participants to have a better understanding of the issues. Green economy means an economy that has the ability to rebuild itself as a stable one. The present economy of China and India are moving too rapidly in recent years and kills the environment that nourishes it which is a sort of suicide like a cancer that eventually led to its death with the elimination of host cells.

**Key word:** Environmental accounting; Green GDP; The green GDP accounting

### 1 Introduction

Accounting sometimes referred to as the language of business hence it can describe all type of business activity even environmental activity. In this article struggles to be the language of environment and language of business for China and India. Accounting is required to submit various types of user information on the financial position and performance of entities in the management of resources at their disposal. In recent decades a growing number of entities give great importance to environmental issues and their reflection by accounting, either under the influence of administrative regulations or because of their information needs. In certain circumstances, for certain fields, they can have a significant impact on the financial statements, and that of their users. Green accounting has been around for two decades. As in all cases, environmental management accounting is a tool to inform managers about the environmental costs, to quantify the environmental effects of the entity. In 3 recent decades, The rapid economic rise of China, followed by that of India, has led to a new balance of power in the world economy .Spectacular economic growth in China and India has serious environmental consequences.. China and India are still in the process of industrialization and urbanization which will exert more pressure on the environment. And since India and China have more than 36 percent of the population of the world the evaluation of the subject in these 2 countries has the greatest importance. In many respects, China and India seem similar. Both are large geographically and have enormous populations that remain very poor. That's why authors have chosen 2 huge population countries in the world (China 1.36 billion and India 1.22 billion in 2012 ) with , the average real rate of GDP growth (during 1978-2007 is 9.9% in China and 5.6% in India) to compare . Environmental pollution becomes so acute and the stakeholders' awareness to the issue becomes so serious that environmental accounting has become a strong branch of accounting. Still, attention towards the style and recognition of environmental accounting is not a generalized one. Legal authorities, standard setting bodies and other regulators cannot come to a consensus regarding the conceptual framework of environmental accounting and its disclosure. Thus, such disclosure is not mandatory rather voluntary that has no specific style or format. With the passage of time, more guidelines are coming in customized format that may lead us to reach a common format for recognizing environment

Related data and disclosure thereof through financial statements. Still, such disclosure is guided by the social responsibility and commitment on the part of the entities that work as strong agents for polluting the environment. More emphasis is given on environmental accounting and awareness for that as this is supposed to be the need of today.

The adverse environmental effect of economic development has become a matter of great public concern all over the world. Gradually, environment is becoming a much more urgent economic, social and political problem Accountants, as the basic custodian and light bearers of economic development, can no longer shut their eyes to the effect of environmental issues on business management, accounting, auditing and disclosure system. Protection of environment and the potential involvement of accountants is becoming a common subject of discussion among the accountants all over the world. Now-a-days, accountants are expected to take a proactive role in the environmental protection process. With the advent of liberalization, removal of trade barrier makes it logical that the costs of environmental



degradation due to industrial activities should be internalized in corporate accounts to the extent possible. That's why environmental accounting and reporting thereof is of paramount important today.

## 2 Green GDP In China and India

$GDP = \text{Consumption} + \text{Investment} + \text{Government spending} + (\text{Export} - \text{Import})$

$\text{Green GDP} = \text{GDP} - \text{Environment costs} - \text{Social costs}$

Green GDP methodology is an adjustment to traditional measures of a country's output of goods and services taking pollution and waste of resources into account. This method refers to an accounting system in which environmental degradation costs and natural resource depletion costs are factored into the calculation of GDP growth. The goal of this methodology is presumably to provide a better measure for guiding public economic policy and thereby contributing to a more welfare-rich outcome than could be achieved using traditional measures. The green gross domestic product (green GDP) is an index of economic growth with the environmental consequences of that growth factored in. In 2004, Wen Jiabao, the Chinese premier, announced that the green GDP index would replace the Chinese GDP index itself as a performance measure for government.

The first green GDP accounting report, for 2004, was published in September 2006. It showed that the financial loss caused by pollution was 511.8 billion yuan (\$66.3 billion), or 3.05 percent of the nation's economy. As an experiment in national accounting, the Green GDP effort collapsed in failure in 2007, when it became clear that the adjustment for environmental damage had reduced the growth rate to politically unacceptable levels, nearly zero in some provinces. In the face of mounting evidence that environmental damage and resource depletion was far more costly than anticipated, the government withdrew its support for the Green GDP methodology.

A measure of Green GDP will almost certainly give policymakers and the interested public a more defensible estimate for the extent and scope of environmental challenges. Based on a review of the two strategies in combating pollution, this paper suggests that a combination of governmental intervention and free-market operation could be a better strategy to reverse China's heightening environmental challenge. The concept of Green GDP was initially developed in the West in the 1960's (Pearce, Markandya, & Barbier, 1989). This concept is a relatively new idea in China and there is controversy over how to implement a financial accounting approach to measure the costs of environmental damage and degradation caused by pollution and resource exploitation. In spite of these difficulties, two Chinese government agencies, the National Bureau of Statistics (NBS) and the State Environmental Protection Agency (SEPA), were designated to research and develop the Green GDP index and use it as a standard measure of China's environmental sustainability. These two government agencies measure environmental costs in terms of economic growth. By so doing, China will be the first country in the world actually implementing the Green GDP concept in the measurement of its economic activities. To better understand the background for the issues involved in China's recent request for Green GDP, it is necessary for a historical review of human activities and environmental protection. Let me briefly review the environmental crisis China now confronts. In the 1960s and early 1970s, when the international community started to pay serious attention to environmental issues, China was experiencing chaos because of the Cultural Revolution. With ignorance, the Chinese government chose to deny its pollution problems and refused to participate in the international conference on human environment by claiming here is no need to participate in a global conference to address the environmental protection. A socialist nation does not suffer from the environmental ills of capitalism" (Ferris & Zhang, 2002).

Unfortunately and ironically, forty years later, China became one of the most polluted nations in the world. The air and water were badly polluted and much of China's land was contaminated, Stalinized or deforested. According to the World Bank, in 2000 China had 16 of the world's 20 most polluted cities. According to the International Energy Agency (IEA) forecasts, the increase of greenhouse emissions from 2000-2030 from China alone will nearly equal the increase from the entire industrialized world.

China's emissions of sulfur dioxide were the highest in the world in 2004. Acid rain caused by coal-burning plants caused striking damage to agriculture, buildings, and public health."(SEPA, 2006). Green GDP accounting is closely related to the basic situation of a country. China and India as developing countries are at the stage of rapid economic development. It has wide territory, huge population and is relatively lack in natural resources. At the same time, the soaring development of economy has resulted in rapid growth of exploitation and utilization of natural resources. The rapid economic development in China and India thus mainly depends on the competition of resource, competition of environment and competition of investment. It is almost impossible to accurately figure

out the pollution costs of China's GDP because of the lack of standards for measurement and the difficulties in collecting relevant data on pollution damage. The World Bank estimated that pollution costs China 5% of its GDP, including health care and lost productivity. In 2004, the Economist estimated that pollution decreases China's GDP by 12%.

At present, green GDP accounting has become an irresistible international trend and will gradually become the important basis for formulating and implementing sustainable development strategy by different countries. It is even more important and urgent to China and India.

Think twice before you cut that tree or throw a plastic bag into the river - you might be lowering India's GDP. India aims to factor the use of natural resources in its economic growth estimates by 2015, environment minister Jairam Ramesh said, Pilot projects have already been initiated and the ministry of statistics & programme implementation is in the process of preparing a national database, making depletion of natural resources a key component in its measurement of GDP.

Beginning in 2010, India, as part of the country's five year plan, aims to factor the use of natural resources into its GDP as a means of underscoring its actions in the fight against global warming. Despite not being obligated to reduce carbon emissions under the Kyoto Protocol, India is taking unilateral domestic actions to move toward a greener economy and to strengthen the country's position as a major player in international environmental initiatives. India's environmental minister Jairam Ramesh hopes to make "green accounting" a reality as part of India's governmental policy on economic growth. Ramesh estimates that by 2015, India should be able to provide alternative GDP estimates that account for the domestic consumption of natural resources. Specifically, these estimates will provide details on the amount of natural resources that are consumed during the course of economic growth, the degree to which the environment is being degraded as part of the growth process, and the amount of mitigation that occurs as a means of correcting this degradation. This obviously presents a number of institutional and policy related challenges. First and foremost, governments do not want to give off the impression that economic growth and development has stalled, either to their constituents or to the international economic community. Accounting for environmental degradation may lead to a significantly lower GDP, which has made many developing countries reluctant to measure environmental impacts. The Chinese example, the preeminent experiment in green GDP, has served to reinforce this fear.

From a policy standpoint, the primary concerns surround how to properly measure environmental degradation in monetary terms, and how that information will be gathered. In developing countries like India, this often has to do with the issue of property rights. Clarifying ownership will help to put a value on clean air, clean water, and other resources. Commonly, this valuation system takes the form of cap and trade or similar policies, effectively allowing the market to determine the price of environmental goods and services. For green GDP to be most effective, companies and other users are relied on to accurately report pollution emissions. This is one of the many problems of being able to "buy" the "right" to pollute - market prices may encourage a polluter to lie in order to keep its emissions within its allotted limits, which would reduce the accuracy of a green GDP measurement. Putting a price on the right to pollute may also stall green innovation that may be beneficial to development and traditional GDP - it may be more economically beneficial for a polluter to buy up more pollution credits than to implement new technologies or retrofit existing ones.

Over the last three decades, the world has been astonished by the miraculous economic growth of China and India. Though there is a gap in the growth performance between the two countries, India has caught up with China in the past decade, particularly in recent years. With both countries' governments being fully committed to the goal of high economic growth, the current development momentum is expected to continue for decades.

However, high growth has been achieved with severe environmental damages such as deforestation, widespread acid rain and deteriorating ambient air quality. These consequences threaten human living space and health, and are costly to deal with. A government report shows that the environmental cost accounts for about 3% of China's GDP. In India it is estimated that the damage and degradation of natural resources is equivalent to about 10% of the country's GDP. While these estimates may be debateable, there is no doubt that pollution has serious health and economic consequences. Independent estimates of the cost to China of environmental degradation and resource depletion have for the last decade ranged from 8 to 12 percentage points of GDP growth. These estimates support the idea that, by this measure at least, the growth of the Chinese economy is close to zero. The most promising national activity on the Green GDP has been from India. The country's Environmental Minister, Jairam Ramesh, stated in 2009 that "It is possible for scientists to estimate green GDP. An exercise has started under the

country's chief statistician Pronab Sen and by 2015, India's GDP numbers will be adjusted with economic costs of environmental degradation. Currently, a framework of China's green GDP accounting has been set up. The next step is to, in addition to improve the current framework, speed up the local pilot work so as to verify the practicability of the theoretical framework. Besides, it is also imperative to strengthen international cooperation to establish a green national economic accounting system that keeps pace with the international society.

### **3 Further Improve the Green GDP Accounting Method**

The green GDP accounting is a complex system, involving not only a complicated economic system but also various kinds of natural resource and environmental elements. As seen from the international research experience, green GDP generally begins with local accountings, or focuses on specific resource types or environmental problems. The statistical institutions within international organizations have timely summarize these local accountings and upgrade them into theoretical and methodological researches, which can serve as methodological direction on the green GDP accounting in China and India.

The improvement of China and India's green GDP accounting theories and methods can be considered from the following four aspects: 1) Further improving the theoretical framework of green national economic accounting. Currently, two relatively ideal frameworks, i.e. China Resource and Environmental Economic Accounting Framework and China Environmental Economic Accounting Framework, which are connected with China's national statistical accounting system and keep pace with the international society, have been formulated. However, there are still leave many detailed problems in the two frameworks. These problems are to be further improved in combination with pilot work. 2) Formulating technical guideline on physical quantity accounting for both the environment and the resources. 3) Formulating technical guideline on value quantity accounting for both the environment and the resources, which are a focus as well as a difficult for carrying out green GDP accounting. The value quantity accounting mainly includes two parts, i.e. natural resource consumption and environmental degradation. 4) Carrying out countrywide survey for environmental pollution loss accounting. The theories and methods of environmental pollution loss accounting will be accomplished on the basis of the national environmental pollution loss evaluation work already undertaken. This is a basic work for green GDP accounting.

### **4 Speeding up Local Pilot Accounting Work**

As a new accounting system, green GDP has the problems of being not in line with traditional national economic accounting system and having difficulty in collection and analysis of statistical data. In addition, it requires huge data and involves many departments for data collection and thus will be difficult to promote. It is possible to first carry out some pilot work in some areas. This will be of realistic significance for the promotion of green GDP in China.

Therefore, SEPA and NBS have determined to first choose 10 provinces (municipalities) to carry out pilot work on green GDP accounting and environmental pollution loss survey during 2004~2006, in order to earn experience for establish national green GDP accounting and environmental pollution loss evaluation system. It has been planned to establish an initial framework of green GDP accounting system that is fit for China's own situations in 3 to 6 years. At the same time, the public awareness on green GDP will accordingly be enhanced. China and India's GDP growth rates have outperformed world average growth rates and, indeed, those of other lower and middle income countries for the most part of the last 15 years. China has grown at an average rate of close to 10% annually during 1990-2006; a rate at which income more than doubles every seven years. Although regarded as a success, India's performance was less spectacular than China's with an approximate rate of growth of 6% annually. The growth of world economy in the corresponding period amounted to approximately 3% annually. Green GDP was weak to begin with because the environment remains a tertiary priority behind growth and social stability. As long as growth continues to generate wealth and social stability, the central leadership will have very little motivation to prioritize the environment, and local governments will have even less motivation to follow central environmental policies.

In the end, the Green GDP program was effectively a strawman set up to appease the global audience and the critics of India and China's environmental record. While the initiative initially made the Chinese and Indians government look progressive and proactive, the numbers that came out of the program revealed a shocking level of environmental degradation, leading Beijing and Delhi to cancel

the program rather than face the embarrassment of more damning statistics.

Key problem in policing a shift towards a greener economy in China and India are highlighted in the experiences and failure of its green GDP project. China and Indian's governance structure for environmental management, the degree of additional data collection required, and lack of consistent rules for environment valuation all contributed to the failure of the use of green GDP in China and India.

## 5 Conclusion

Greening the national accounts is useful, especially in developing countries like China India which are characterized by high population growth and pressure on natural resources. The adjusted GDP acts as a deflator to the real GDP. The gap between GDP and the adjusted GDP serves as a signal of importance of environmental effects. China and Indian's miracle of economic growth might end soon because it will be overwhelmed by environmental problems. Regardless, the Green GDP estimates provide a better understanding as to the serious extent of the environmental challenge. The Green GDP report serves as a wake-up call for China to undertake the challenge seriously and immediately.

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## Determining Salient Characteristics of Chinese Tourists to Understand the Differences among the Groups

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**Abstract:** This paper aims to find out the critical factors that play a role in the mind of tourists and non-tourists. The primary objective of this analysis is to understand differences among the groups (as defined by the dependent variable- tourists and non-tourists), and to predict the likelihood that an observation will belong to a particular group. To investigate this, discriminant analysis has been conducted that is a multivariate statistical technique used to estimate the relationship between a single categorical dependent variable (such as tourist versus non-tourist) and a set of metric (interval or ratio level) independent variables.

**Key words:** Tourism; resort visit; customer attitude; relationship.

### 1 Introduction

There is little doubt that the tourist industry is an important sector of economy. It is amazing to note that, tourism is the world's largest industry and so is of vital importance to the global economy. Its contribution has risen dramatically over recent decades. The World Travel and Tourism Council (WTTC) estimate that travel and tourism were directly and indirectly responsible for generating 11% of world GDP and 200 million jobs across the global economy.<sup>[1]</sup> China is also making huge revenue from the tourism in the recent years.

While gaining from tourism, customer retention is getting concentration day by day as well as the new customer generation. Management is pressing more pressure on the satisfaction of the existing customer as it makes the firm unbeatable in the complex and competitive business world as well it helps to create new customers.

Another important aspect is that most of the time international tourism and tourists are the peak of discussion. But from the marketing point of view China itself has a huge market that consists of almost 1/6<sup>th</sup> of the total world market. So, determining the salient characteristics of the domestic tourists is worth of investigation. In this paper we have conducted a two-group discriminant analysis. Its predictive function might be used to classify potential customers to differing marketing programs depending upon known social, economic and geographic characteristics.

### 2 Literature Review

Tourism is primarily a service-based industry, principal products provided by tourism and recreation businesses are recreational experiences and hospitality.<sup>[2]</sup> So, past experience with different tourism sectors is a key for customer retention or simply said- revisit intention.

Lee<sup>[3]</sup> considers the pleasure market as the more fickle of the travel industry's market segments. It is price-sensitive and easily affected by economic conditions. Tourism industry faces great competition from non-travel entertainment for both individual's leisure time and discretionary income. Factors such as lack of transportation facilities and poor weather may also have negative effects on the decision on whether or not to travel.

Echtner and Richie (1991) argue that many studies on destination image only focus on the attributions, and neglect the important factor of attitudes that significantly shape the holistic image perceived by tourists.<sup>[4]</sup>

Gartner (1993), Prebensen (2007) also shows that most image studies dealing with tourism have employed attribute lists to measure the cognitive component (people's perceptions) of destination image.<sup>[5, 6]</sup>

Caswell & McConnell (1980), Eymann & Ronning (1992, 1995) and Walsh et al. (1992) consider that family size (a commonly used indicator of household size) plays an important and deterrent role in recreational decisions, both in the realization of holidays and in the determination of the destination, as large family size restricts holiday spending.<sup>[7-10]</sup>

### 3 Methodology

On the basis of literature review, a primary questionnaire was developed. In primary questionnaire, there were six variable. Dependent variable was categorical. Independent variables were metric variables. The family or household that visited a resort during last year are coded as 1 and those who did not were coded as 2 (travel). Data were also obtained on annual family income (income), attitude towards travel (travel attitude), importance given on family vacation (family vacation importance), family size (fsize), age of the family head (age), earlier experience with tourist agent (experience), Places of historical or cultural interest (cultural interest).

SPSS software has been used for the mathematical computation. Discriminant Analysis Model is as follow:

#### 3.1 Discriminant Analysis Model

The discriminant analysis model involves linear combinations of the following form:

$$D = a + v_1X_1 + v_2X_2 + v_3X_3 + \dots + v_iX_i \quad (\text{here } i=7)$$

Where,

$D$  = discriminant score (discriminate function)

$v$  's = discriminant coefficient or weight for that variable

$X$  's = predictor or independent variable (respondent's score for that variable)

$i$  = the number of predictor variables

- The coefficients, or weights ( $v$ ), are estimated so that the groups differ as much as possible on the values of the discriminant function.
- This occurs when the ratio of between-group sum of squares to within-group sum of squares for the discriminant scores is at a maximum.

#### 3.2 Output:

**Table 1 Group Statistics**

	travel	Mean	Std. Deviation
1	income	60.112	9.6037
	travel attitude	5.960	2.1662
	family vacation importance	5.720	1.6542
	fsize	4.080	.8999
	age	53.440	8.8713
	earlier experience with tourist agent	5.640	1.8043
	historical or cultural interest	4.680	2.3338
2	income	41.913	7.4198
	travel attitude	3.733	2.3034
	family vacation importance	4.067	2.0160
	fsize	2.800	.9248
	age	50.133	8.1272
	earlier experience with tourist agent	4.333	1.9179
	historical or cultural interest	5.267	2.4202
Total	income	53.288	12.4909
	travel attitude	5.125	2.4566
	family vacation importance	5.100	1.9591
	fsize	3.600	1.0978
	age	52.200	8.6980
	earlier experience with tourist agent	5.150	1.9429
	historical or cultural interest	4.900	2.3686

**Table 2 Pooled Within-Groups Matrices**

		income	travel attitude	family vacation importance	fsize	age	earlier experience with tourist agent	historical or cultural interest
Correlation	income	1.000	.167	.162	.202	.132	.250	.106
	travel attitude	.167	1.000	.058	.258	-.172	.651	.277
	family vacation importance	.162	.058	1.000	.043	.005	.125	-.021
	fsize	.202	.258	.043	1.000	-.057	.164	.124
	age	.132	-.172	.005	-.057	1.000	-.124	-.108
	earlier experience with tourist agent	.250	.651	.125	.164	-.124	1.000	.679
	historical or cultural interest	.106	.277	-.021	.124	-.108	.679	1.000

**Table 3 Tests of Equality of Group Means**

	Wilks' Lambda	F	df1	df2	Sig.
income	.496	79.198	1	78	.000
travel attitude	.805	18.894	1	78	.000
family vacation importance	.831	15.867	1	78	.000
fsize	.677	37.161	1	78	.000
age	.966	2.771	1	78	.100
earlier experience with tourist agent	.893	9.381	1	78	.003
historical or cultural interest	.985	1.153	1	78	.286

**Table 4 Eigenvalues**

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	1.529 <sup>a</sup>	100.0	100.0	.778

a. First 1 canonical discriminant functions were used in the analysis.

**Table 5 Standardized Canonical Discriminant Function Coefficients**

	Function 1
income	.656
travel attitude	.184
family vacation importance	.202
fsize	.394
age	.100
earlier experience with tourist agent	.170
historical or cultural interest	-.369

**Structure Matrix**

	Function 1
income	.815
fsize	.558
travel attitude	.398
family vacation importance	.365
earlier experience with tourist agent	.280

age	.152
historical or cultural interest	-.098

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions  
 Variables ordered by absolute size of correlation within function.

**Table 6 Canonical Discriminant Function Coefficients**

	Function
	1
income	.074
travel attitude	.083
family vacation importance	.112
fsize	.433
age	.012
earlier experience with tourist agent	.092
historical or cultural interest	-.156
(Constant)	-6.822

Unstandardized coefficients

**Table 7 Functions at Group Centroids**

travel	Function
	1
1	.946
2	-1.576

Unstandardized canonical discriminant functions evaluated at group means

**Table 8 Classification Results<sup>b,c</sup>**

travel		Predicted Group Membership		Total	
		1	2		
Original	Count	1	46	4	50
		2	0	30	30
	%	1	92.0	8.0	100.0
		2	.0	100.0	100.0
Cross-validated <sup>a</sup>	Count	1	40	10	50
		2	2	28	30
	%	1	80.0	20.0	100.0
		2	6.7	93.3	100.0

a. Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

b. 95.0% of original grouped cases correctly classified.

c. 85.0% of cross-validated grouped cases correctly classified.

#### 4 Conclusions and Recommendations

This paper aims to find out the critical factors that plays a role in the mind of tourists and non-tourists. The primary objective of this analysis is to understand differences among the groups (as defined by the dependent variable- tourists and non-tourists), and to predict the likelihood that an observation will belong to a particular group. The signs of the coefficients associated with six predictors out of seven are positive. This suggest that high family income, attitude towards travel, importance given on family vacation, family size, age, earlier experience with tourist agent are more likely to result in the family visiting the resort. It would be recommended to develop a profile of the two groups in



terms of the six predictors that seem to be the most important. This research methodology might be used to classify potential customers to differing marketing programs depending upon known social, economic and geographic characteristics.

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# The Impact of Wayfinding Signage System Setting on Visitors' Wayfinding Behavior Model in Theme Park: A Case Study of The Summit in Hong Kong Ocean Park\*

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**Abstract:** Theme park is a kind of modern travel destination integrated of leisure, entertainment and services. Fine service is an important factor of evaluating a theme park, and to allow visitors to travel without wayfinding puzzle in the theme park is the basis of good service. The essence of wayfinding signage system is to guide visitors to their destinations quickly through effective wayfinding information-delivery, and, at the same time, to balance the number of the visitors in order to improve the utilization of recreational facilities and service facilities. Based on the investigation combined with the actual observation to position setting and types setting of different types of signage, the text puts forward the portfolio management methods for wayfinding signage system and describes the impact of wayfinding signage system setting on visitors' wayfinding behavior.

**Key word:** Theme park; Signage setting; Wayfinding Behavior; field survey

## 1 Introduction

### 1.1 Theme park background

In recent years people's spiritual and cultural life becomes increasingly rich, and choices of leisure entertainment have been diversified. Theme park, which creates specific environment, atmosphere, games and activities around one or several themes to attracting a large number of visitors, is still a relatively new way of amusement to Chinese. Besides the theme park in mainland of China, Hong Kong's theme park, Disneyland and Hong Kong Ocean Park will also usher in a large number of visitors from mainland each year.

At the current stage, there are many researches of vision and setting of wayfinding signage in the field of landscape design. The management science also has mature research in the visitors' behavior. But there is a lack of the combination of the two related research, especially the impact of wayfinding signage system setting on visitors' wayfinding behavior in theme park, and this study will carry out case study in this point.

### 1.2 Visitors' wayfinding behavior in theme park

Wayfinding, in the concept of geography, refers to the behavior that people find the way in unfamiliar environment, which is a purposeful and initiative action to solve problems of dynamic space. In general, wayfinding can be divided into two steps: making a decision and implementing a decision. People in unfamiliar environment should firstly confirm their destination, then determine the spatial relationship of their location and the destination, and finally work out a plan. Throughout the process of wayfinding, whether the information of signage in the environment is adequate and correct enough to convey information effectively or not, is the key to decide if visitors can possibly establish correct cognitive maps and find the way.

Usually, people need the help of landmarks and spatial differences to find the way in unfamiliar environment, so the unique identifier of the space plays a vital role in wayfinding. However, in theme parks, there are rare symmetrical, repetitive space structures. Different shape, multi-dimensional constructions, various decorations, materials and colors are used to create visual highlights to attract tourists. Hence, wayfinding in theme park differs from that of general space.

In different occasions, there are different factors to measure wayfinding of tourists. Referring to wayfinding indicators from Carpmann Grant and Simons (1984) research, this paper statistically analyzes the wayfinding in theme park. The observed programs include backing, wrong turning, stagnating, looking around and watching signs.

### 1.3 Method

#### 1.3.1 Case background

Hong Kong Ocean Park is a 17-hectare marine-based theme park, with more than 40 attractions.

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There are two theme areas—The Waterfront and The Summit. The latter one also includes four sections: Marine World, Thrill Mountain, Rainforest and Adventure Land. Since Hong Kong Ocean Park has a vast area, complex path and all kinds of rides, there are much more wayfinding signage needed than other common theme parks. In addition, whether the wayfinding signages are reasonably set according to their type and location should be seriously considered.

### 1.3.2 Contents and method of survey

This paper, using field survey method, makes a statistical analysis to the selected representative wayfinding signage. The investigation site is The Summit of Hong Kong Ocean Park. The specific program include drawing a sketch of The Summit according to site inspection and cartographic material and marking the specific location of wayfinding signage; inspecting the status quo of wayfinding signage system in The Summit and classifying them; using non-participatory observation method to observe the wayfinding behavior of visitors and find out what effect the wayfinding signage have on the visitor's wayfinding behavior.

## 2 Wayfinding signage system in theme park

### 2.1 The characteristics of Ocean Park

Wayfinding signage system is a visual wayfinding information-delivery system based on the spatial cognition style of human, helping people move in the right direction. It usually includes graphics, font, color, map and other visual elements. There is no difference in the overall design principles of wayfinding signage system between theme park and general park. However, the particularity of theme park results from its different starting point and demand of design. To Hong Kong Ocean Park, there are the following characteristics:

1)High reputation. There are a large number of tourists no matter in working days or holidays. The rationality of the design of wayfinding signage system directly affects the diversion between the adjacent theme areas, which is very important to balance the number of visitors.

2)Broad area. The space form is more complex, and there are more attractions. Wayfinding signage setting should adapt to the complex path and play a correct role in wayfinding.

3)Due to the entertainment properties of Ocean Park and visitors' demands of exploration, the setting of the number and position of wayfinding signage needs to be carefully considered. Unreasonable settings will lead to waste of resources, and visitors will lose interest in exploring the park.

4)Ocean Park is divided into The Waterfront and The Summit two theme areas. Every theme area has its unique atmosphere. Wayfinding signage system will have to adapt to the atmosphere and balance the unity between different needs and decoration, in order to create a seamlessly unreal atmosphere.

### 2.2 Classification of wayfinding signage in Ocean Park

Ocean Park's wayfinding signage system can be categorized into several signage types: Identification sign, direction sign, orientation sign, explanation sign and prohibition sign according to the information content.

1)Identification sign. Name identification is the most basic identification information. It is used to indicate the name of the object. From a functional point of view, such sign helps visitors to identify their destination, location and establish a certain degree of spatial cognition. It is the most commonly used type of sign in the process of wayfinding.

2)Direction sign. The main function of direction sign is to guide visitors to the right place. It usually contains two parts of compositions: arrows and names of places. This kind of sign is mainly used for identifying the information, when visitors walk on the road. So the setting number of the sign and recognizable degree has larger demand.

3)Orientation sign. The orientation sign generally will provide more comprehensive regional spatial information. Providing visitors with overview of the space by maps, charts and other forms helps visitors to make a route-decision. Due to the large amount of information, it usually takes a long time to read. "You Are Here" map belongs to the orientation sign.

4)Explanation sign. The explanation sign is used to elaborate the intention of setting the sign, such as services interpretation, operating norms and usages, etc. It is necessary to deliver a very large amount of information. In the theme park this kind of sign often used to explain the security and operating norms of attractions. It's a kind of quite important sign.

5)Prohibition sign. Prohibition sign is a kind of regulative sign mainly used to regulate visitors to the rules in park, including functions such as warnings, reminders, and recommendation, etc.

### 3 Case Study

This paper mainly chooses the route from Summit Plaza to Pacific Pier in The Summit of Ocean Park as the research object. Summit Plaza is the first stop to The Summit by the Ocean Express from The Waterfront. The Summit contains these four theme areas: Marine World, Thrill Mountain, Rainforest and Adventure Land. This paper takes Summit Plaza as a start place and Pacific Pier as a destination, the Pacific Pier is the second attraction from Summit Plaza to Marine World. There is only one path between two places. However, visitors will pass by Rainforest and meet two t-junctions in this path which is about 250 meters and contains 12 wayfinding signages. It is a very typical path which demands clear wayfinding signage settings.

#### 3.1 The portfolio management for wayfinding signage system setting

In the concept of management, portfolio management refers to optimization and balance of the individual's advantages and strengths. Then put these advantages together scientifically to avoid risks and maximize the benefits. This approach is often used for economic activities, but in fact the same can be applied on the setting of wayfinding signage system. Each kind of wayfinding signage contains different elements, which are scientifically combined to form an effective set, so that the wayfinding signage brings a benign influence to visitors' behavior.

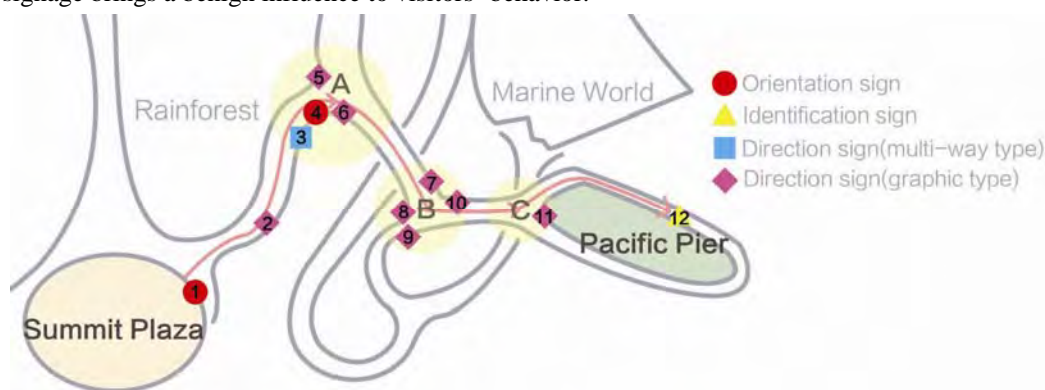


Figure 1 Location of Classified Wayfinding Signage

Table 1 Types of Wayfinding Signage

Orientation sign <span style="color:red">●</span>	Identification sign <span style="color:yellow">▲</span>	Direction sign(multi-way type) <span style="color:blue">■</span>	Direction sign(graphic type) <span style="color:purple">◆</span>
(1)(4)	(12)	(3)	(2)(5)(6)(7)(8)(9)(10)(11)

Figure 1 and table 1 show that:

1) There are five types of wayfinding signages, but actually only three kinds of signage existing in Summit Plaza to Pacific Pier path, including orientation sign, identification sign, and direction sign. The direction sign can be categorized into multi-way type and graphic type. Among these types the graphic type of direction sign distributes most.

2) In the path from Summit Plaza to Pacific Pier, about 70 meters distance apart will distribute a direction sign in order to maintain the coherence of wayfinding signage.

3) Multi-way type of direction sign can be adapted to the multiple directions of visitors and uses stereoscopic approach to give directions. The entire layout only has simple text and arrow, as the identifiability is quite strong, it is suitable for visitors to read and make judgments quickly when they are walking. Graphic type of direction sign doesn't have intuitive indication of the direction, but carries more abundant information with the highlighted text of main items and assisted with images and icons., which suits for all kinds of visitors' wayfinding behavior with wayfinding target.

4) Point A, point B and point C are three different levels of intersections. There are three alternative paths radiates from point A and point B, as only one valid path to the Pacific Pier from point C. Point A and point B are both road junctions, while point C is at the junction of Rainforest and Marine World and has a higher flow of visitors so that there will be more visitors needing to make decisions at point A. According to the field survey, Point A has three types of signages: orientation sign, direction sign (multi-way type), direction sign (graphic type) and Point B only has direction sign (graphic type). At secondary intersection, point C, there only exists one graphic type of direction sign.

**3.2 The wayfinding signage setting at key position and visitors' wayfinding behavior**

The following table of data uses the non-participatory observation method to experiment. 10 visitors under test start from Summit Plaza to find their way to Pacific Pier, and record their wayfinding behavior at point A, point B and point C.

**Table 2 Statistics of Visitors' Wayfinding Behavior at the Key Position**

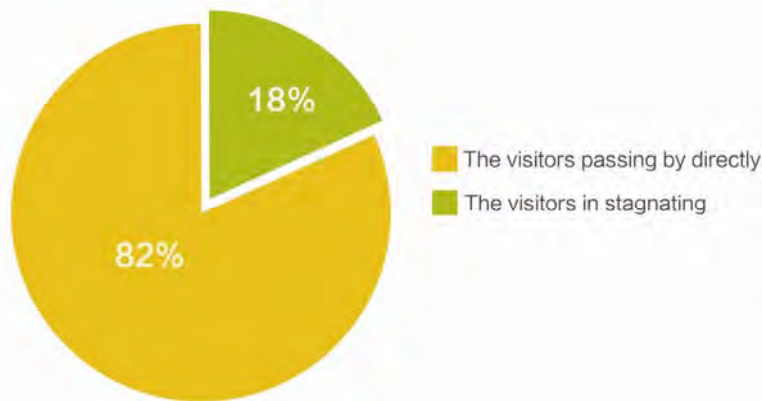
Key Position \ Statistical indicator	A	B	C	Unit
backing	2	1	0	Number of people
wrong turning	2	1	0	Number of people
stagnating	6	6	3	Number of people
looking around	10	7	4	Number of people
watching signs	10	10	10	Number of people

Table 2 shows that:

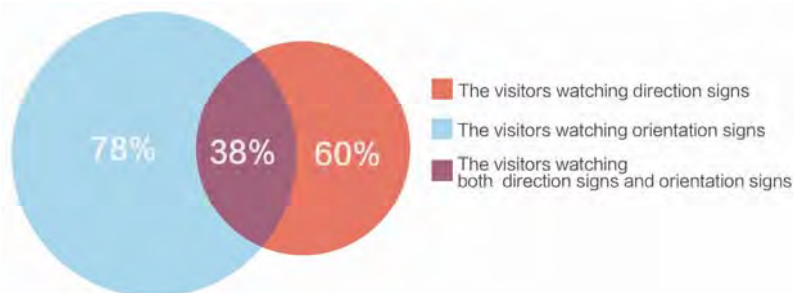
1)As the visitors under test looking for destination with purpose, there will be more behaviors such as stagnating, looking around and watching signs to help them find their way. At point A, B and C, all the visitors under test have behavior of watching signs. With the help of wayfinding signage, most visitors are able to find the right path and only few of the visitors behave in looking around and watching signs, which indicate the wrong wayfinding.

2)Road junction point A and B are the places where visitors are more likely to get lost and behave in slowing down, which is generated from stagnating and looking around. As point A and B are the intersections that have more optional direction and more wrong wayfinding behaviors than point C, these places are the key positions that should be enhanced the signage system setting. Therefore it is very reasonable for different types of wayfinding signage setting at key positions as gathering point. In addition to the intersection, the attractions and public services are also the key positions that should be enhanced the setting of wayfinding signage.

**3.3 Different types of wayfinding signage and visitors' behavior**



**Figure 2 The Visitors in Different Behaviors at Key Position A**



**Figure 3 The Stagnant Visitors Focusing on Different Types of Wayfinding Signage**

Figure 2 and figure 3 show that:

1) There are two types of visitors at key position point A: one will pass by point A directly without stay, one will slow down or behave in stagnating, looking around and etc, which refer to stagnant behavior. The visitors passing by directly account for 82% of the visitors, while the visitors in stagnating account for 18%.

2) Among visitors who are in stagnating and need to make wayfinding decisions at point A, 78% choose to watch orientation signs, 60% choose to watch direction signs, between which 38% of visitors use both two types of signage to find their way. More visitors of those who looking for destinations with purpose choose the help of the orientation signs.

## 4 Conclusions

### 4.1 Visitors' touring pattern in the theme park can be divided into two types: wandering, purposely finding.

1) Wandering. Due to the demands for leisure and exploration, the majority prefer wandering pattern in the touring process. In other words, they won't determine their own attractions firstly, but choose playpoints freely according to their interest. To visitors who play randomly, identification signs have greater impact on them. The identification signs in bright colors or strong visual effects are likely to attract tourists, while direction signs are often saw by chance when walking, let alone orientation signs and maps.

2) Purposely finding. Purposely finding can be divided into two cases, one is finding attractions and another is looking for public service facilities such as restaurants, toilets, and stroller parking, etc. To those visitors, they have strong purpose so the orientation sign and maps are more useful for them.

In general, both touring patterns exist in the touring process rarely one of them emerges separately. Therefore, the portfolio management method is used in the setting of wayfinding signage system; according to different visitors and combining directional signs effectively is necessary.

### 4.2 The impact of wayfinding signage system setting on visitors' behavior at the key positions of theme park

1) At key positions, such as the intersection, especially the intersections of park junction usually need to deal with the wayfinding needs of visitors from different directions. Visitors' divergence at the intersection is crucial for crowded theme park; appropriate wayfinding signage setting can balance the number of visitors for each theme area. Simple graphic type of direction signs cannot completely satisfy the wayfinding needs of the tourists from all directions and need the assistance of multi-way type direction signs, which will give more intuitive directions to visitors. Also, it is suitable for visitors who choose the wandering touring patterns to identify the directional information quickly while walking.

2) Key positions usually are the decision-making intersections or direction changing places, where the combined setting of direction signs and orientation signs make the process of wayfinding easier. The surrounding circumstances related to visitors' location are quite important when the visitors have the purpose of looking for an attraction but have no idea where they are. The orientation signs and direction signs that only contains regional or overall map of the park do not work. Only the direction signs and the "you are here" maps can provide better help to visitors' wayfinding.

3) The key positions are also the places need to enhance the wayfinding signage setting, including the intersections, junctions of theme areas, public service facilities, attractions, etc. In visual aspects, increasing identifiable degrees, adding more artistry and interest, can be applied in enhancing wayfinding signage. Setting types, quantity and the orientation of the panels should be considered when setting wayfinding signage as well.

4) Adding pictures or icons of important attractions on the layout of the direction signs, allow the visitors without reading ability receive the right directional information; general visitors also have a more intuitive impression about their destination. As everyone has a different capacity for remembering information, the cognitive ability of visitors and personal wayfinding experience are diverse, more forms of signs are needed to meet the wayfinding demands of different visitors.

### 4.3 The impact of wayfinding signage coherence on visitors' behavior

Wayfinding signage system plays its role for orientation through a series of composite signs. The coherence of wayfinding signage is a key factor for the success of visitors' wayfinding behavior and relates to the sense of wayfinding security. To those who prefer a casual wandering in the theme park, their wayfinding model usually is: picking a way casually at first and making a turn when they meet a

sign. Visitors may keep walking straight if they miss the sign until they meet next sign. If the next sign doesn't exist or the destination is wrong, they will turn back and that's how the wrong wayfinding behavior forms. Wayfinding signage system can be seen as information reconfirming process in which visitors' memory is related to the wayfinding success. The distance between two signs should be suitable, so that visitors are able to confirm whether they choose the right path. And the wayfinding signage also should be set at the intersections where visitors need to make decisions, so that visitors' wayfinding behavior can continue.

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# The Development and Innovation of Urban Public Transport System

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**Abstract:** With the accelerated urbanization process in China, the rapid development of the city, and the improvement of people's living standards, the process of motorization has accelerated noticeably. Giving priority to the development of public transport is not only the key to improve the urban transport, but also directly related to the city's sustainable development. As the accumulation of practical experience, the deepening of the theory understanding and the needs of modern urban development, major cities have presented the strategy about the development of urban public transport system. Among them, some theories are noteworthy, such as the public transportation system, urban and rural public transport co-ordination, integration of urban and rural public transport, public transport based on TOD mode and the bus rapid transit system, and so on. According to the study of these theories and the discussion for the planning of the Bus Priority network, this paper finds a system thinking about the planning of Bus Priority.

**Key Words:** Public transport; Sustainable development; Public transportation system; Integration

## 1 Introduction

With the rapid development of social and economic construction, the size of modern city has been continuously expanding. As a result, the city is more dependent in the transport system. Traffic congestion and environmental pollution, which seriously restrict the operation efficiency of urban transport, have become the focus of attention, waiting to be solved. The United States put forward a set of system of transport planning theory, which emphasizes detailed investigation and analysis to the condition of the future traffic, the vehicle growth trend and the existing infrastructure. Generally speaking, the urban traffic planning result is based on urban development planning, transport strategy planning, recent traffic action plan and the major traffic facilities of the assessment. In recent years, according to the different characteristics of the urban traffic, some developed countries put forward some characteristic planning theories. The most typical is that Japan puts forward "railway nodules point" theory and Russia puts forward "traffic ShuNiuDian" theory. "Railway nodules point" theory in favor ShuNiuDian railway scattered on the cultivating the urban function, in order to form the function and structure of the big cities. And these theories are viewed as the prerequisite in realization of the central city structure.

On the basis of increasing the urban infrastructure, how to using modern high-tech and giving priority to the development of public transport is not only the key to improve the urban transport, but also directly related to the city's sustainable development. Some theories are noteworthy, such as the public transportation system, urban and rural public transport co-ordination, integration of urban and rural public transport, public transport based on TOD mode and the bus rapid transit system, and so on. These theories can be regarded as a kind of way to achieve the optimal control of the urban transport, which can not only effectively improve the traffic conditions, reduce the mounting congestion and auto environmental pollution, but also improve the overall level of transport and provide an all-around quality service.

## 2 The Back Ground of Urban Public Transport

As the development of China's economy and society and the implementation of urbanization, on the one hand, China's urbanization process is continuously deepening which drive a lot of rural labor migrating to the city or changing to other non-agricultural field, making the connection closer between urban and rural areas, villages and towns. As a result, the scale and scope of public flow has been expanding which brings the increase of passenger flow volume; on the other hand, the gradually expanding of the urban scale and the significantly increasing of the urban population make the traffic problem more and more serious, such as traffic environmental pollution, traffic congestion and traffic accidents, and so on. In modern process of China's urbanization, urban and rural population structure has undergone tremendous changes, mainly reflected by the increasing urban population and the



aggregation of the floating population. The urban public transport and short-haul highway passenger between city and countryside, which grew up in 1980s, meet the travel needs of the urban and rural residents to a certain extent. However, since the beginning of the new century, the deep drawbacks of the original public transport mode gradually exposed because of lacking unified planning and management, such as the lack of coordination of the development of many transport modes between the urban and rural passenger, management system intersecting with each other, the lack of unified planning for infrastructure construction and using, there always being contradictions and unfair competition between the urban public transport and road short distance passenger, having no unified planning of departing, scheduling and the stops.

The management system of urban public transport and short distance passenger between city and countryside artificially separates the traffic connection between downtown and countryside, which apparently can't adapt to the needs of modern city's development. Under this background, the concept of the development of modern big cities' public transport system came into being.

### **3 The Development Strategy of Urban Transport System**

The concept and connotation of urban public transport is the lifeblood of the city, the main symbol of urban modernization, the critical infrastructure which is closely related to people's production and life and a kind of social welfare undertaking which is related to the national economy the people's livelihood. As the accumulation of practical experience, the deepening of the theory understanding and the needs of modern urban development, major cities have presented the strategy about the development of urban public transport system. Among them, some theories are noteworthy, such as the public transportation system, urban and rural public transport co-ordination, integration of urban and rural public transport, public transport based on TOD mode and the bus rapid transit system, and so on.

#### **3.1 The concept and connotation of large public transportation system**

Two concepts "large public transportation" and "large public transportation system" frequently appear on some papers, magazines, conferences, newspapers and network. However, up to now, academia and the public utilities departments have not give authoritative definition to their meanings. The explanation on some magazines is that "large public transportation" is to establish the dominant position of public transport in urban traffic, founding an urban public passenger transport system which is economic, convenient, efficient and sustainable development and radiating to the urban and rural areas. As the continuous advance of China's urbanization process and the in-depth development of the public transport, "large public transportation" and "large public transportation system" is indeed able to express the development trend of public transport in metropolitan area today. However, urban development needs the academic community to determine the accurate definition of these two concepts as soon as possible so that they can play an active role to the reform of China's urban public transport in theory and practice.

With the combination of the explanation given by the above mentioned newspaper and some practice of establishing large transportation system, the author thinks that the definition should be: a large transportation system is a development theory of "people oriented" and bus priority which is established in the process of urbanization today and to establish a secure and economic, efficient and fast, convenient and comfortable and sustainable development regional public transport system and make the culture between cities, city and countryside come true via the integrated use of advanced technology and a variety of public transport resources. Its connotation includes the following aspects:

- 1) The core concept of large transportation system is to give priority to the development of urban public transport and to establish the dominant position of public transport in urban traffic.
- 2) The connotation contains the combination of a variety of transport modes, including regular bus, rail bus, taxi and free bicycles, and cable car, water ferries in some cities, and so on.
- 3) It is benefit for promoting urban sustainable development and regional economic development,
- 4) It has a strong radiation function so that it can promote the process of urbanization.
- 5) It should be organically connected with urban external transport system.

#### **3.2 The concept and connotation of passenger transportation in the urban and rural**

There are some statements whose meanings are similar in the development process of urban and rural passenger, such as coordination of urban and rural public transport, integration of urban and rural transport, integration of urban and rural passenger, passenger transportation in rural areas and integration of urban and rural road passenger transportation, and so on. Among them, coordination of urban and rural public transport, integration of urban and rural passenger, and integration of urban and

rural road passenger transportation are the more common concepts. If there are too many different concepts whose content are similar, people may be confused so that the concept and connotation should be unified to a clear concept. Although these concepts are not uniform, they are suggested under the background of the continuous improvement of passenger transport infrastructure in urban and rural roads, the rapid development of road passenger transport and the transition of urban and rural road passenger transport management system, which inevitably can provide a well reference to the study of urban and rural passenger. Although these concepts and assertions express differently, we can find that they include the following common elements through analysis:

(1) Background. They are all under the background that the process of China's urbanization is speeding up, with the expanding of the metropolitan areas, and based on the reform of the existing passenger transport system and breaking the dual structure of urban and rural passenger.

(2) Guiding ideology. They all have proposed the integration of urban and rural passenger transport, focusing on exploring to make the urban and rural passenger comply uniform regulations, according to the unified planning, and implement an integrated management and operation.

(3) The ultimate aim. They are all in order to establish a passenger system which is convenient for the urban and rural residents and promotes the synchronic development of the urban and rural society and economy.

The essence of the reform of urban and rural passenger transport is to break the urban-rural dual structure, making the urban and rural residents equally enjoy the convenient travel resources. In view of this, the author thinks that the urban and rural passenger transport should be included in the scope of public transport, and it is more accurate to use the concept of "the integration of urban and rural public transport" which can be call as "public transport" or "bus" to a certain stage of social development. The author agrees with the definition given by Zhang Jianfeng: the integration of urban and rural public transport organically combined the elements of stations, operating structure, vehicle operation, and network expending and management system through the rational allocation of the various elements of the urban and rural road passenger. It use the operation way of public transport to achieve the orderly flow of passengers and the orderly operation of the market, and ultimately achieve the aim of making the passenger's travel more convenient and promoting social and economic development.

### **3.3 Public transport based on the TOD mode**

Transit-oriented development model (TOD) is a community which is compact layout and has a mixed function. It encourages people do their best to reduce the use of private car and use more public transport through reasonable planning and regarding a public transport site as a center. After many years of theoretical exploration and practice of summary, TOD has gradually developed into a special kind of "land unit" from the early concept of a planning, becoming a new urban basic constitute structure which is different from the traditional "car transit-oriented" structure. Its development and construction has a positive effect at the aspects of guiding the city reasonably expanding, giving priority to the development of public transport and effectively controlling the car using.

In China's urbanization process, the scale of the city expands rapidly, proactively combining the urban development planning and the public transport development planning to found a public transport based on TOD mode. This will be an important way to achieve the urban comprehensive transport system whose main part is the public transport.

### **3.4 Bus rapid transit**

Bus rapid transit (BRT) is a kind of new public passenger transport system and a road transport mode with large capacity which is between the rapid rail transit (RRT) and normal bus transit (NBT), usually called "the subway system on the ground". It is a unique urban passenger transport system which opens up the bus lane roads, constructs new bus stations and achieve an operation services which is similar to rail transit through the combination of modern public transport technology and the intelligent transportation technology, and operation management, so that it can be close to light rail service.

BRT is a kind of high quality, high efficiency, low power consumption, low pollution and low-cost public transport mode, fully embodying the development philosophy of people oriented, and building harmonious society. We can know that the environment pollution of BRT is lower than other auto traffic measures in figure 1. At the same time, the table 1 shows that the BRT is more convenience and it costs lower than other traffic measures.. At present, BRT has been a new public transport mode which is widely promoted in the world and its effect for the development of urban transport has been paid more and more attention in China. So far, some cities in China have founded BRT system, such as Beijing, Guangzhou, Zhengzhou, Jinan, Xiamen, and so on.

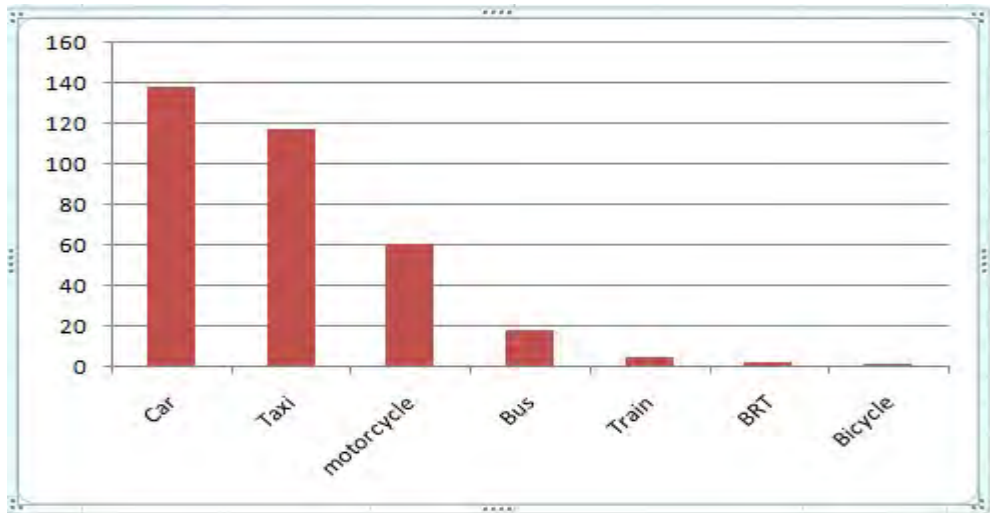


Figure 1 Data of Carbon Dioxide Emissions (G/1 Person·Km)

Table 1 Comparison of Technical Economic Among BRT, Light Railway And Subway

Index	BRT	Light railway	Subway
Road characteristics	Special or Mixed flow lanes	Special or Mixed flow lanes	Special lanes
Distance(Km)	350-800	350-800	500-2000
Capacity(person)	40-120	110-250	140-280
Average speed(Km/h)	20-40	20-45	25-60
Safety performance	High	High	Highest
Cost of construction(10 thousand\$)	600-1500	1200-3400	1,2000-1,8000
population	750,000	1,000,000	2,000,000

#### 4 Internal Relation of the Above-Mentioned Concepts

The above context has made a simple description to several important concepts in the development of modern public transport system. These concepts are not isolated, and there must be a necessary connection between them because they appeared simultaneously during the process of urban space rapidly expanding and the rapid development of public transport.

People’s demand for fast travel, caused by the expansion of the urban space and the evolution of the urban-rural relations, promotes the appearance of BRT. In turn, because the development of urban public transport has active effect on city’s development, the appearance of BRT provides a foundation for the concept of urban development based on TOD mode. They are the two aspects of one question: TOD is the mode of urban development, while BRT is the support of urban development. The city Kultiba’s practical experience of combining BRT and TOD has proved the coordination between public transport and urban development.

The integration of urban and rural public transport, leaded by urban development (the expansion of the urban space and the evolution of the urban-rural relations) and the common development of public transport system, has become a historical necessity.

The integration of urban and rural public transport is the initial stage of the large public transportation system. The construction of the integration of urban and rural public transport is the foundation of the construction of urban large public transportation system. As the integration of urban and rural public transport gradually becoming mature, it can establish a regional public transport system which is secure and economic, efficient and fast, convenient and comfortable and sustainable development and achieve passenger transportation between cities and the urban and rural areas by integrated use of advanced technology and a variety of public transportation. That is to say, it is the ultimate purpose of the integration of urban and rural public transport to construct large public transportation system.

## 5 Conclusion

The essay makes an explanation and analysis of the city's public transportation system development of the bus system, and we also put forward some advises based on the TOD and BRT model. The future development of public transport system in major cities should not only reflect high efficiency, but also ensure that it has high enough quality of service. In order to achieve high efficiency of the urban traffic, there must be a fast means of transportation; only owning a high enough quality of service can the citizens conveniently use public transport services, the attractiveness of public transport be improved, and make the public transport play the main role in urban transportation system. The future development of the public transport system in major cities must consider the sustainable development of cities and should be matched with the layout of the city's land. The future development of the public transport system in major cities should also abandon the backward traditional planning and management methods, as well as the traditional mode of public transportation system. According to the needs of modern urban development, a new modern urban public transportation system should be constructed. In view of this, the main direction of future development of the public transport system in major cities is the construction of large public transportation system which is based on TOD mode and supported by BRT mode. What need to be emphasized is that different cities should find a suitable large public transportation system for itself according to its own actual situation of natural conditions, cultural background.

In modern time, the BRT and TOD are improving quickly, but there are some problems which should be solved in the future. For the BRT, the most serious problem is the illegal across the street, vehicles damaged and that the BRT special channel is used by other cars. As to the construction of bus TOD mode in our country, we should introduce bus classification ideas and strengthen the urban planning of foresight, systematic, and make it adapt to the need in the nature to ensure the effectiveness of implementation of the bus TOD mode.

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# Study on Rivalrousness Between Midland Intercity Track Transportation and Highway Transportation Based on Logit Model

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**Abstract:** With the boost of the intercity track transportation in China, traditional highway transportation will face increasingly fierce challenge. The factors are analysed that influence the rivalrousness between them. The distribution rates on passenger flows between the intercity track transportation and highway transportation are estimated based on Logit model. A new method is used to calculate the utility value of transport product. And the utility function of transport product is applied instead of the traditionally used linear regression functions in the Logit model. Finally some suggestions about the development of highway transportation are given.

**Key words:** Logit model; Distributing rates; Rivalrousness

## 1 Introduction

With the rapid development of economy in the midland of China, Intercity passenger flow is growing rapidly. With the appearance of the intercity track transportation, traditional highway transportation face the increasingly fierce competition. The competition between the two are mainly embodied in the distribution rates on passenger flows .Therefore, the estimation of the distribution rates on passenger flows, the analysis of the highway passenger competitive advantage and coping strategies for highway transportation is very significant.

## 2 The Main Index Which Influence Rivalrousness between Midland Intercity Track Transportation and Highway Transportation

The rivalrousness between midland intercity track transportation and highway transportation is mainly embodied in the passenger flow. The result shows the distribution rates on passenger flows between them. There are some factors which influence the midland intercity track transportation and highway transportation, for example safety, promptness, economy, comfort and convenience, service, quality, etc. This paper selects the safety, promptness, economy, comfort four index as main index which influence rivalrousness between midland intercity track transportation and highway transportation. Based on the four indexes, this paper selects Wuhan-Yichang intercity track transportation as example for the estimation of distributing rates.

## 3 Distribution Rates on Passenger Flows between Midland Intercity Track Transportation And Highway Transportation

Logit model is a relatively mature method on estimation of distribution rates, usually used to estimate the distribution rates of traffic origin and destination points.

### 3.1 Logit model

The general form of Logit model is:

$$P_i = \frac{e^{U_i}}{\sum_{i=1}^m e^{U_i}}$$

In the formula,  $U_i$  is utility value of product i. m is the amount of product i.

$P_i$  is the probability of product i being selected, and  $\sum_{i=1}^m P_i = 1$ ,  $0 < P_i < 1$ .

The utility function of product i is usually presented as a linear combination of safety, speed, economic and comfort etc. as

$$U_i = \sum_j W_j C_j$$

In the formula,  $w_j$  is the weight of j character;

$W_j$  is the value of j character;

Utility value of Logit model is mainly determined by effect factors and respective weights. Once the weights are determined, the parameters of the model are confirmed. There are several methods as below.

(1) Maximum-Likelihood method

This method evaluates future situations depends on present data, deviations inevitably exist. Maximum-Likelihood usually faces shortage of sample data in practice because ticket price remain the same and it is difficult in obtaining data.

(2) Experienced opinion poll to determine weight

Firstly, choose evaluation indexes. Then build evaluation matrix through survey and confirm weights of evaluation indexes by paired comparison. Possible changes can be given as assumptions in the process of survey, choice of respondents can be obtained. But its basic idea is still the linear correlations between utility value and effect factors; it is not the accurate description of actual situation.

(3) Possible satisfaction method

Choosing the basic indexes and confirming their utility values, total possible satisfaction comes by linear combination. Utility value of each index comes by expert assessment and evaluation. It is different with the actual situation as this method has not considered the weights of parallel factors.

This paper chooses an improved possible satisfaction method to estimate the distribution rate on passenger flows between Wuhan-Yichang intercity track transportation and highway transportation based the characteristics and feasibilities of above methods. This method not only overcomes shortage of sample data, but also no more be confined to linear combinations of effect factors. The improvement in solving characteristic function of Logit model expands the scope of application of the model to some extent.

**3.2 Utility value**

The basic idea of possible satisfaction is the “possibility-satisfaction” curve which is composed by possibility  $p(r)$  and satisfaction  $q(s)$  of attributes. The curve quantitatively describes the degree of possibility and satisfaction, as  $W(a) \in [0,1]$ . In the context,  $W(a)$  is used to get utility value of transport product.

Possibility-satisfaction of category index is composed by indexes  $W(a)$  through multi-dimension assembly rule of multi-objective decision according to their importance and correlations after utility values of basic indexes have been confirmed. Utility value  $V$  is the total possibility-satisfaction of the scheme. Addition rule and multiplication rule are mostly used in the process of combination.

Addition rule: If effect factors which determine an attribute are independent, their functions are different only in degree and can be linearly compensated by each other. Addition rule runs.

$$V = \sum_{k=1}^n C_k(A, B, \dots, F) W_k$$

In the formula,  $C_k(A, B, \dots, F)$  is weight index, and  $0 \leq C_k \leq 1, \sum_{k=1}^n C_k = 1$ .

Multiplication rule: If effect factors which determine an attribute are independent, their functions are different only in degree and essentially the same. But only when all factors are effective, the attribute effect. Once a factor is not effective, the attribute is not effective though other factors are effective. So multiplication rule comes.

$$V = \prod_{k=1}^n W_k C_k(A, B, \dots, F)$$

In the formula,  $C_k(A, B, \dots, F)$  is weight, and  $0 \leq C_k \leq 1, \sum_{k=1}^n C_k = 1$ .

To compare Wuhan-Yichang intercity track transportation and highway transportation, this paper choose four indexes: safety, speed, economic and comfort. Utility value of transport product is determined by the formula below.

$$V = W_1 C_1 (W_2 C_2 + W_3 C_3 + W_4 C_4)$$

In the formula,  $W_1, C_1$  respectively represent possibility-satisfaction and weight of safety;  $W_2, C_2$

respectively represent possibility-satisfaction and weight of speed;

$W_3, C_3$  respectively represent possibility-satisfaction and weight of economic;

$W_4, C_4$  respectively represent possibility-satisfaction and weight of comfort.

Confirm possibility-satisfaction and weight through survey and data of Wuhan-Yichang intercity track transportation and highway transportation.

### 3.2.1 Confirm possibility-satisfaction

Considering the correlations of indexes and utility value, rules must be obeyed: safer, more utility value; faster, more utility value; less ticket price, more utility value; more comfort, more utility value. Indexes of possibility-satisfaction are confirmed through market survey and expert assessment and evaluation. As followed:

#### (1) Safety

Statistic analysis shows that passengers prefer track transportation to highway transportation in safety. But safety of intercity track transportation still has space to improve at hardware-software. Safety possibility-satisfaction value of track transportation is 0.9 while highway transportation is 0.8.

#### (2) Speed

Speed mainly embodied in journey time and speed. Run time of track transportation has 3 kinds: 108min, 120min and 132min; the average departure interval is 30min. Total average journey time of track transportation is  $T = (108 + 120 + 132) / 3 + 30 / 2 = 135 \text{min}$ . Average run time of highway transportation is 255min; the average departure interval is 30min. So the total average journey time of highway transportation is  $T = 255 + 30 / 2 = 270 \text{min}$ . Possibility-satisfaction value is 1 when the total journey time is less than 150min. So speed possibility-satisfaction value of inter-city track transportation is 1 while highway transportation is 0.6.

#### (3) Economic

Economic mainly embodied in ticket price. Price of inter-city highway transportation has two classes, class I and class II. Because station of Wuhan, Wuchang and Hankou locate in different places, each class has 3 kinds of prices. Class I : 114 Yuan, 107 Yuan and 103 Yuan; Class II : 95 Yuan, 89 Yuan and 85 Yuan. Respectively the train number is: Class I : 5, 9 and 19; Class II : 5, 9 and 19. The majority of passengers prefer cheap price, the weight of Class II is 0.8. Average ticket price of highway transportation is  $C = (114 \times 5 + 107 \times 9 + 103 \times 19) / 33 \times 0.2 + (95 \times 5 + 89 \times 9 + 85 \times 19) / 33 \times 0.8 = 91 \text{Yuan}$ . Ticket price of highway transportation has 4 kinds: 60 Yuan, 80 Yuan, 110 Yuan and 150 Yuan. Respectively the weights are 0.6, 0.2, 0.1 and 0.1. Average ticket price of highway transportation is  $T = 60 \times 0.6 + 80 \times 0.2 + 110 \times 0.1 + 150 \times 0.1 = 78 \text{Yuan}$ . The majority of respondents feel that the ticket price is high, so economy possibility-satisfaction value is 1 when the price is 60 Yuan. Then economy possibility-satisfaction value of inter-city highway transportation is 0.75 while highway transportation is 0.85.

#### (4) Comfort

Inter-city highway transportation is better than highway transportation in comfort, so possibility-satisfaction value of highway transportation is 0.9 while highway transportation is 0.8.

### 3.2.2 Confirm the weights

Weight of index which apply to multiplication rule is 1. Sum of index weights is also 1 if the indexes apply to addition rule. So safety weight is 1 and sum of speed weight, economy weight and comfort weight is 1. The weights of factors come through paired comparison. Compare the importance of speed, economy and comfort, weights come as followed.

$X_1, X_2$  and  $X_3$  respectively represent comfort, speed and economy. To highway transportation passengers, results show as below.

(1)  $X_1$  To  $X_2$ ,  $X_2$  is more important.

(2)  $X_1$  To  $X_3$ ,  $X_3$  is more important.

(3)  $X_2$  To  $X_3$ ,  $X_2$  is more important.

Comparison matrix is:

$$A = \begin{bmatrix} 1 & 1/5 & 1/3 \\ 5 & 1 & 3 \\ 3 & 1/3 & 1 \end{bmatrix}$$

Result comes through sum-product method:

$$C = \begin{bmatrix} 0.106 \\ 0.633 \\ 0.260 \end{bmatrix}$$

Consistency check,  $\lambda_{\max} = 3.038$ .

$C.I. = 0.019$ , when  $n = 3$ ,  $C.R. = 0.58$ ,  $\frac{C.I.}{C.R.} = \frac{0.019}{0.58} = 0.033 < 0.1$ , so result of the survey is acceptable in consistency, the weights is reliable. Similarly, corresponding index weights of highway transportation is

$$C = \begin{bmatrix} 0.106 \\ 0.633 \\ 0.260 \end{bmatrix}$$

Above all, possibility-satisfaction and weights of Wuhan-Yichang intercity track transportation and highway transportation show in table 1.

**Table 1 Index Possibility-Satisfaction and Weights**

	index	Inter-city track transportation	highway transportation
safety	possibility-satisfaction	0.9	0.8
	weight	1	1
speed	possibility-satisfaction	1	0.6
	weight	0.633	0.26
economy	possibility-satisfaction	0.75	0.85
	weight	0.26	0.633
comfort	possibility-satisfaction	0.9	0.8
	weight	0.106	0.106

$$V = W_1C_1(W_2C_2 + W_3C_3 + W_4C_4)$$

Utility value of track transportation and highway transportation:

Inter-city highway transportation:

$$V_1 = 0.9 \times 1 \times (1 \times 0.633 + 0.75 \times 0.26 + 0.9 \times 0.106) = 0.83$$

Highway transportation:

$$V_2 = 0.8 \times 1 \times (0.6 \times 0.26 + 0.85 \times 0.633 + 0.8 \times 0.106) = 0.62$$

Distribution rate of Wuhan-Yichang intercity track transportation:

$$P_1 = \frac{e^{V_1}}{e^{V_1} + e^{V_2}} = \frac{e^{0.83}}{e^{0.83} + e^{0.62}} = 0.55 = 55\%$$

Distribution rate of highway transportation:

$$P_2 = 1 - P_1 = 45\%$$

In present conditions, distribution rate of Wuhan-Yichang intercity track transportation is 55% while highway transportation is 45%. Considering safety, speed, economy and comfort, highway transportation has the advantage of speed while highway transportation has the advantage of price. Pursuing speed and comfort is the development trend, economy weight will decrease. Highway transportation should work out corresponding policy to take the advantage of accessibility and convenience.

#### 4 Competitive Analysis of the Intercity Rail Transit and Highway Passenger Transport

The boost of intercity track transportation is a huge challenge undoubtedly for highway transportation. The intercity track transportation caused a serious threat for highway transportation.



To enhance the comparative advantages to intercity track transportation, highway transportation enterprise must further optimize the allocation

of resources, make scientific development strategy, make full use of its advantages in avoid direct conflict with intercity track transportation and continuously improve its competitiveness.

The fare is one of the important influence tourist factors. It is necessary to low down the price of bus and improve transportation hardware to face competition from intercity track transportation. Through the integration of line resources, it is possible to reduce line overlap, eliminate peer competition and improve the profession competitive power.

## 5 Conclusion

Based on the analysis of the factors which influence the trip of people, Logit model is used to calculate the distribution rate of midland intercity track transportation and highway transportation. A new method is used to calculate the utility value of transport product. And the utility function of transport product is applied instead of the traditionally linear regression functions in the Logit model. The application scope of Logit model is expanded. Finally some suggestions about the development of highway transportation are given to make full use of its advantages and continuously improve its competitiveness

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## Study on Optimization Mechanism of the Land for Suburban Tourism\*

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**Abstract:** Based on the perspective of stakeholders, this study has carried out the complete information dynamic game tree analysis between the residents and the government, the incomplete information game analysis on the payoff matrix between residents and the tourism developers, the incomplete information dynamic game analysis between the government and tourism developers and has put forward three measures of optimal utilization for tourism suburban land: scientific planning to coordinate the development between urban and rural; intensive conservation to use suburban land reasonably; leading by the government to achieve the dynamic management of land.

**Key words:** Optimization Mechanism; Stakeholders; Land for Suburban Tourism; Game Analysis

### 1 Introduction

With the accelerated process of urbanization and the rise of the city circle, cities get closer than before and the noisy from city agglomeration makes people more eager to visit the pure leisure place. The good ecological environment and convenient geographic conditions of suburb gradually attracts more and more tourists, and a mass of “rural tourism”, “farmyard tourism” and other tourism products spring up. Suburban tourism land is a general term of the land which can directly or indirectly meet the visitation, recreation and relaxation demands of visitors on the transition zone shifted from urban function to the countryside function, and can provide space for tourists to make a series of tourism activities. Urban expansion will possibly make the landscape disappear in rural and urban handover zone and also will exacerbate land contamination, which would undermine the use of suburban tourism land. In tourism development, there are some various conflicts of interest among the local residents, government and developers, so how to guarantee and coordinate all parties also has become an important issue. Optimal utilization of suburban tourism land has guiding significance for protecting people's leisure needs, promoting rational planning of urban functions and achieving the scientific management of land utilization. This article researches on the mechanism of suburban tourism land in order to find some ways to promote their sound development.

The research on suburban tourism land started in 1960s abroad. Scholars' researchers were mainly from the stakeholders' attitude on tourism land and the development and utilization of tourism land. On the aspect of stakeholders' attitude, Wesley and Fesenmaier (1987) have discussed that there were many local residents in America holding a negative attitude to developing tourist destination. Yalein Kuvan and Perran Akan (2005) have researched on people's attitude for developing tourism land in Turkey Belek resort town. According to the result, the residents held a positive attitude on developing local tourism, and at the same time, they were concerned about the negative effects on local forest tourism resources brought by travel industry. On the aspect of development and utilization of tourism land, Hammes (1994) has analyzed the land market could be influenced and caused changes by what kind of factors in the spatial pattern of land rent from the perspective of developing the tourism resort town. About the researches of Richard Sharpley(2002) and Abby Liu(2006), the former thought that financial support and technical support were two essential aspects in developing rural tourism land and the latter researched the development of tourism land in Malaysia through investigating stakeholders' views, planning agencies, travel communities, development initiatives, etc.

Study of suburban tourism land in China only has nearly a 20-year history, but the content has been very broad. Zou Tongqian(2002) has divided the planning of suburban tourism land into two parts:land for the tourism industry and tourism activities. Chen Yuping and Li Jiangfeng(2003) have taken JingXia district of Wuhan City as an example, they analyzed quantitatively mutual conversion among the land utilization types. Xi Ya(2004) has thought that the development of small spots in suburban is an

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important aspect to optimize the land utilization structure. Cheng Xu(2006) has proposed the concept of leisure agricultural land from the perspective of multifunction of suburban land utilization.

Reviewing the literature, we can find that foreign scholars tend to emphasize the relationship between the human and the tourism land while the domestic scholars tend to study the development and planning of land utilization. It is need to strengthen the management mechanism from the perspective the coordination of the stakeholders.

## 2 The Game Theory of Suburban Tourism Land Stakeholders

The main stakeholders in the development and utilization of suburban tourism land are the local residents, the government and the tourism developers. There is a game of interests among the three parties.

### 2.1 Interests between local residents and government

When developing a suburban tourism land, the government needs to expropriate large areas of land from local residents. The land is farmers' lifeblood. Only when the government guarantees the farmers' more superior living standard and the source of income after losing the land, will farmers hand over the land to the government. However, the local government always played a leading and controlling role while the residents are generally in a vulnerable position in the game and sometimes their demand is very difficult to satisfy (Zhang Anmin, 2007).

We may regard the land-levying as a complete information dynamic gambling process between the government and local residents. (Figure 1, represent local government, B represent local resident):

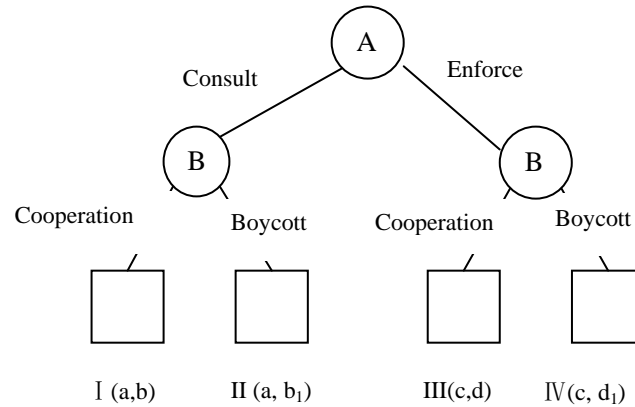


Figure 1 Game Tree Between The Local Residents and The Government

The land-levying is one kind of government action. We assume that the government acts first, and the strategy collection is (negotiation, enforcement), while residents' corresponding strategy collection is (cooperate, boycott). They take appropriate action after the government, both parties can predict gains and losses of their actions, so that can form the following four groups of strategy collection: I (the government consultation, residents cooperation); II (consultation with the Government, the residents resisted); III (government forces, residents of cooperation) and IV (the government forces, residents boycott). Through the Figure 1, we may make the following analysis of these four combination ways: if the local government is willing to consult the land-levying way and the local residents would like to cooperate, both parties reach the agreement through the voluntary consultation, and they may obtain the greatest income. Uses  $a$  and  $b$  separately indicated and the gross revenue is  $a+b$ . This is an ideal equilibrium state, represented by I; if local residents resist the local government's land-levying, and the two parties cannot reach a voluntary agreement through consultation, government's land-levying way and the income will not change, which still is  $a$ . The residents' resistance can make their cost increased, and their income reduced, the income value is  $b_1$  ( $b_1 < b$ ), total income is  $a+b_1 < a+b$ , represented by II; If the local government expropriate the land by force and the residents accept this way, the land-levying agreement may achieve, but the bilateral benefit proportion has certain change. The government compulsory land-levying makes its income increased, the income value is  $c$  ( $c > a$ ), which represents the government's compulsory land-levying can get more profit. Under this condition, the residents' profit value is  $d$  ( $d < b$ ), which expressed that the way the government compulsory land-levying make the

resident benefit impaired. The assumption  $c+d < a+b$ , expresses that government's compulsion needs to spend certain cost, so the gross revenue reduces, represented by III; if the local government compulsory land-levying way is resisted by residents, the government land-levying way has not changed, the income is invariable, which still is  $c$ . The resident resists under the compulsion, which will recall their partial rights and interests, so the profit will be higher than that in cooperation state of government force, and simultaneously it will be lower than in the voluntary consultation state. Assume that profit is  $d_1$  ( $d < d_1 < b$ ), then  $c+d < c+d_1$ , and assume  $c+d_1 < a+b$ , which is expresses that both parties spend the cost against each other. Total income is less than voluntary state, represented by IV.

Based on  $b_1 < b$ ;  $a+b_1 < a+b$ , the local government would choose the consultation way and the best choice for local residents is cooperation because it reaches the balance and makes the benefit maximization and achieves a win-win situation. Specifically speaking, the government builds roads and provides hydropower, invests money, develops the economy and resolves the appropriate farmers work for the development traveling. And the local residents get corresponding compensation. Take tourism development as an opportunity to try new rich channels, so as to ultimately promote local economic development.

**2.2 Interests between local residents and tourism developers**

Tourism developer's aim is profit. They pay attention to short-term gain and the shorter payback period project of investment capital. This is conflicting with the long-term development interests of local residents. Residents are the ultimate undertakers of locally comprehensive developed economy, environment, and society. Whether the tourism developers take the local residents' profit into account through the construction process, including solving the employment problems of inner area, providing a entrepreneurial opportunities, dealing with the pollution problems, eliminating unhealthy entertainment activities, has a profound impact on residents(Lu Xiaoli, 2006).

Tourism developers' attitude to the interests of local residents is either consideration or not-consideration. Local residents' attitude to the construction of tourism developers is either support or not support . We can design the following payoff matrix model to analyze:

**Table 1 Local Residents and Tourism Developers Pay Matrix Model**

		Tourism developer	
		<i>Consideration</i>	<i>Not consideration</i>
local residents	<i>Support</i>	1, 1	-1, 2
	<i>Not support</i>	2, -1	0, 0

Assumptions are as follows: When tourism developers' attitude is consideration and local residents support, the income is (1, 1),when tourism developers' attitude is no consideration and local residents support. the income is (-1, 2), we know that when local residents choose support, the optimal strategy for the tourism developers is not-consideration. When tourism developers consider and local residents not support, the income is (2,-1),when tourism developers not consider and local residents do not support, the income is (0, 0), obviously that when local residents select not-support, the optimal strategy for the tourism developers is not-consideration .So (Not consideration. Not support) constitute a balanced game NASDAQ. However, this can result in conflict in both parties. Pareto is not the most optimal, because the income of combination strategy (consideration. support) is (1, 1), so that both sides have Pareto improvement. If the government department has come forward to coordinate, specifically discuss the rights and obligations of both parties and constrain in the form of contract in development, it can achieve (consideration. support) win-win result.

**2.3 Interests between government and tourism developers**

The main interests focus on whether developing tourism between government and tourism developers is destroying or protecting the environment on the traveling development. Local government bears direct responsibility for the protection of vegetation and forest fires, water pollution and so on. If the original ecology of the areas around the city developed tourism, facilities construction and visitors entering will impact on the environment. And on tourism development enterprise, investment in pollution prevention is large and there is comparison of investment benefit among enterprises, perfectly competitive market economy without government intervention and constraints, Game party governed the admissibility of the tend to co-operate, the formation of non-cooperative game(Yuan Yazhong, 2007), needed for government intervention.

We will view all relevant tourism developers as an Enterprise B, which constitutes a dynamic game

with the Government A. Figure 2 is a subgame of Government (A) and tourism enterprises (B) dynamic game.  $p_1, p_2, q_1, q_2, p_3, p_4$  refer to the probability of selected corresponding strategy for game player which is hard to know for each other.  $(w, u)$  refers to the benefit of A, B game parties. In this subgame, if  $p_1 = 1, p_2 = 0$ , then the game ended prematurely. When people's living standard improves continuously, they are more demanding on the quality of the environment, so the government begins to set new environment standards. Then the game begin again and the quality of environment will continue to improve. The government's "heavy fines and legal prosecution" for tourism enterprises is a "threat ". If  $q_1 > q_2$ , it is a credible threat, the business in the last stage is likely to select the "To implement environmental standards, to perform environmental obligations"; on the contrary, if  $q_2 > q_1$ , then the game will continue, the situation will be exacerbated and the environment develop toward the vicious direction. The manufacturers and the Government of the dynamic game shows that, although the government is involved in, if it did not play authority, mandatory and so on features well, the government failure to make this dynamic game unlimited proceed.

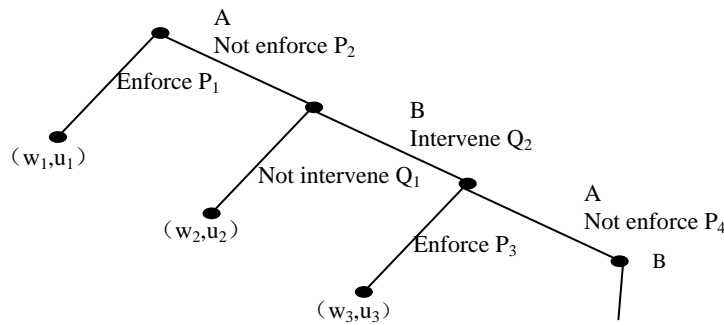


Figure 2 Game Tree Between the Government and Tourism Developers

### 3 Conclusions

In the suburban tourism development and protection, government, local residents and tourism developers' interests all should be balanced, not only to promote tourism development in the short term ,but also to achieve long-term sustainable development of regional economy .Based on the above game analysis, the article proposes the following measures of optimization mechanism:

#### 3.1 Planning scientifically, and develop harmoniously in urban and rural area

The key points of suburban tourism land planning as follow: Firstly, the lands can not be over-exploitation, secondly, should study city and suburban as a whole. Establish the development of tourism industry chain and promote economic development, prevent the local residents' living environment destroying, increase tourism development opportunities for residents to participate in, solve the corresponding employment problems and improve residents' life quality. Develop and utilize suburban tourism land rationally, optimize upgrading and adjustment of urban industrial structure, divide the production sites and ecological sites among cities scientifically, so economy development and people life will coexist harmoniously.

#### 3.2 Utilize suburban land rationally, intensively and conservatively

Infrastructure construction and project classification layout are serviced in the intensive use of land and sustainable development. The existing land use policies focuses primarily on the inner city, but the thinking of suburban tourism land intensive utilization is deficient. As to develop tourism, Government can take preferential polices to attract foreign investment, but it needs to consider that urban suburbs as the city's "back garden", urban and rural areas of the buffer zone, is the lifeblood of the local residents, citizens' basket and an important role in regulating climate(Li Jiangmin,2005).It need to consider the resource protection in the industrial setting and make the project assemble in industrial zone.From extensive to intensive development of tourism sites. Change the extensive way into intensive in exploiting tourism land, create a leisure ecological space with rich culture, focus on energy recycling, utilize land intensively conservatively, and achieve sustainable development.

#### 3.3 Led by the government to achieve the dynamic management of land

Assess suburban tourism land Comprehensively and quantitatively from the economic, social and environmental aspects , deal with the most optimal problem of land allocation by using systems engineering theory and approach, legislate strictly and strengthen the management. On the basis of fully considering the local industry structure, location characteristics and environment protection

requirements, guide the urban and rural land using and constructing. To developers, government has to separate suburban tourism land and industry land so strictly that they will not influence each other, and decrease the pollution as minimal as possible (Qu Jian, 2008). To developers, government should play its authority and mandatory well on rational utilization and environment protection of land, set effective regulation to promote sustainable use of land. Besides, government needs to establish a land information system which is compatible with land use characteristics and adjusts the land using purpose screamingly and rationally according to different requirements in different development stages, makes dynamic and efficient management in land utilization.

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## A Probe into American Marine Management Policy

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**Abstract:** A nation's marine management policy assumes great importance to its national safety and development. In this essay, the author analyses the marine management policy of the U. S. A. in hope to provide some references to the management policy in China. The author thinks that without correct and effective marine management policy, the country can not protect its sea rights and interests and consequently lead its marine industry to failure. It concludes that effective marine management policy will absolutely attack maritime terrorism, smuggling and transnational crimes, keeping peace and order and improving marine environment.

**Key Words:** Marine management ; Sea rights; Sea interests; Peace and order

### 1 Introduction

In a sense, the development course of global ocean order incarnates the historical trend from maritime hegemony politics to maritime rights politics, which is the process from western countries striving for and expanding maritime hegemony, eroding colonies and semi-colonies to the fact of developing countries fighting and rebuilding the international ocean order. The global ocean politic is basically the combination of realpolitik and right-orientated politics. On one hand, in the state of anarchism of colonialism and imperialism dominating the international politics, the emergence and development of sea powers depends mostly on their strong gun boats. And nowadays, the national power system, which is composed of many factors of sea power, economic strength, scientific and technological strength, state institution and national quality, is still the important indicator to distinguish the nation's power and strength. On the other hand, International Law of the Sea constitutes one of the important parts of International Law. From the early period, Portugal and Spain divided their vested maritime interests by conventions. In 1930s, The International Federation of International Law Committee compiled the ocean law and at last published the United Nations Convention on the Law of the Sea, which laid off lots of international maritime legal institutions, including territorial sea, exclusive economic zone, continental shelf, the open sea and marine environment protection. All of the above reflect the global effort of the world trying to solve the problem of distributing sea rights and sea interests. As a matter of fact, the core of international marine management is the concern of sea power, sea rights and sea regime.

### 2 The Importance of formulating Marine Management Policy

#### 2.1 The evaluation of the vast wealth of U. S. oceans and coasts

America is a nation surrounded by and reliant on the oceans. Whether the fisherman in Maine, or the home maker in Oregon, whether the businessperson in Miami, or the farmer in Iowa, every American influences and is influenced by the sea. Careful stewardship of the ocean and coastal resources is imperative to conserve and improve the financial, ecological, and aesthetic benefits.

America's oceans and coasts are big business. The United States has jurisdiction over 3.4 million square nautical miles of ocean territory in its exclusive economic zone—larger than the combined land area of all fifty states. Millions of families make a living directly or indirectly from the resources of the sea.

In 2000, the marine economy contributed more than \$117 billion to American prosperity and provided well over two million jobs. Roughly 75% of the jobs and half the economic value were produced by ocean-related tourism and recreation. For comparison, ocean-related employment was almost 1.5 times larger than U.S. agricultural employment in 2000, and total economic output was 2.5 times larger than that of the farm sector.

The level of overall economic activity within the coastal area is even higher. More than \$1 trillion, or 10% of the nation's annual gross domestic product (GDP) is generated within the near shore area, which is the relatively narrow strip of land immediately adjacent to the coast. Looking at all coastal watershed counties, the contribution swells to over \$4.5 trillion, half of the nation's GDP. The contribution to employment is equally impressive, with 16 million jobs in the near shore zone and 60

million in coastal watershed counties. (See table 1 )

**Table 1 Marine and Coastal Value and Comparison of Government Investment**

Evaluated Value	Financial Year	percentage
The proportion of Marine Economy in National Budget %	2004 Financial Year	7. 4
The proportion of Marine Economy in National GDP %	2004 Financial Year	1. 2
The proportion of the Federal Marine Spending in National budget %	1990 Financial Year	0. 6
The proportion of the Federal Marine Spending in National budget %	2004 Financial Year	0. 3
The proportion of the Federal Marine Spending in National budget %	2006 Financial Year	0. 3

The oceans provide tremendous value to our national economy. Annually, the ports handle more than \$700 billion in goods, and the cruise industry and its passengers account for \$11 billion in spending. The commercial fishing industry's total value is over \$28 billion annually, with the recreational saltwater fishing industry valued at around \$20 billion, and the annual U.S. retail trade in ornamental fish worth another \$3 billion. Nationwide retail expenditures on recreational boating were over \$30 billion in 2002. Governments at all levels, universities, and corporations provide many other jobs in oceans-related fields which range from management and law enforcement to pollution prevention and research. (See table 2)

**Table 2 The Change in Economy of Coastal Economic Zone in 1997-2007**

Employment	Average Annual change %	GDP	Average Annual change %
Coastal states ---107600000	1. 1	11. 4 trillion	3. 4
Watershed county---69300000	1. 0	7. 8 trillion	3. 4
Coastal economic zone ---56200000	1. 0	6. 6 trillion	3. 6
Coastal county ---45600000	1. 2	5. 1 trillion	3. 3

In addition, valuable oil and mineral resources are found off shores and in the seabed; they fuel cars as well as economy, provide materials for construction and shoreline protection, and offer exciting opportunities for the future. Currently, about 30% of the nation's oil supplies and 25% of its natural gas supplies are produced from offshore areas. These energy supplies also provide a major source of revenue and numerous jobs. Since the beginning of the offshore oil and gas program, the Department of the Interior has distributed an estimated \$145 billion to various conservation funds and the U.S. Treasury from bonus bid and royalty payments related to ocean energy.

## 2.2 The importance of formulating marine management policy

Marine management policy is a significant part in a national politic system which is the operative norm set up by the government to achieve the ocean development goal in a particular time. A nation's marine management policy embodies the requirement on its political and economic development that is the basic principle to draw up the definite policy about its marine development and utilization, marine environment protection and sea rights and interests maintenance. In a sense, it's vital to direct national marine development.

The earth is the only planet human can survive on, more than 75% is covered by water. Maritime strategy, cultivation and comprehensive utilization is the cornerstone for national existence and competition. Whoever gains the initiative on ocean will hold the privilege on marine cultivation. In a sense, the evolution of international maritime policy shows a historical trend of maritime hegemony policy to power policy. The global maritime politics itself is combination of power and rights. Maritime policy is vital to a country's economic and social development, which is the action rule of international maritime struggle and cultivation. The maritime policy is the reflection of national policy, economy and social aim which is the main principle of maritime cultivation, maritime environmental protection and interest maintenance. As a matter of fact, international maritime policy is the combination of all the political activities focusing on national sea power, sea rights and sea interests. Sea power and sea interests make up the two basic aspect of international research into maritime policy and strategy. Marine issue is becoming an important area which involves international relationship and international law.

However, international marine management is the combination of all sorts of political activities that the sovereign states conflict and coordinate with each other centring on sea power, sea rights and sea



interests, the core of which is the distribution of sea power and the sharing of the sea rights (as a matter of fact, those reasonable and unreasonable policies both exist).

The sea power is the significant base for maintaining the national sea interests. On the one hand, mighty sea power and successful marine management policy can effectively defend national sea interests. On the contrary, weak sea power and loose management policy is likely to lead to the damage or even deprival of national sea interests. That is to say, sea power is the effective measure to maintain and realize national sea interests. On the other hand, maintaining and realizing sea interests is the aim of sea power construction. The scale, nature, content and extent of a nation's sea power construction must be under the guidance of its purpose of sea interests, and serve the overall requirement of its sea interests.

In a sense, the international political disorder which surrounds sea power struggle plus the international conflict on sea power is the interior motive of laying down international law of the sea, whereas the purpose of which is to get rid of the state of disorder of the struggle, and realize the goal of reasonable distribution of the sea power and sharing of the sea rights. Sea power and sea interests exactly make up the two nuclear concept of international marine policy study, and from which extends the two important aspect of international marine management research—research on international politics and international law, coupled with the cross-banding of the two. Sea matter, at home and abroad, has been a very important area of research about international relation, international law and their cross-banding research.

### **3 The Theoretical Basis of American Ocean Policy**

Since the early days of the establishment of the federal government, the American marine policy was to serve the independence of the state, national economic construction and its territorial expansion in north America. The main point of its marine policy at this time was to protect America from the attack across the Atlantic ocean. From 1890 till the end of the cold war in 1991, the main purpose of its marine policy was to seek the maritime hegemony, during which time, the U.S. walked out the America and entered into the ocean to strive for its international position. As a result, many people regard the 20<sup>th</sup> century as “American Century”. Under the influence of the Mahan's Sea Power Theory, American Navy is becoming the tool for its territorial expansion and through the two world wars, it becomes the superpower over sea. And after the cold war, America has been increasing its strong desire to lead the world, thus it begins to adjust its marine policy by laying down a series of regulations and strategic documents to maintain its maritime and international hegemony.

In the implementation process of its marine development strategy, the U.S. is the country who has laid down the earliest and most documents on ocean management policy. Early in 1959, it formulated the first world military oceanography regulation—the United States Oceanography Ten Years Planning. And since 1960s, the U.S. government draw up a series of marine management and development policy, such as the United States Oceanography Long-term Planning by the U.S science and technology commission and oceanography commission in 1963; Our Country and Marine- the National Action Plan in 1969; The national Ocean Science and Technology Development Planning in 1986; The Marine science and Technology Development Report of 90s in 1990 and the United States Marine Work Agenda of 21<sup>st</sup> Century in 1998 etc. Most of the documents clearly point out that it should keep and improve its leading position on marine science and technology. And in 1999, the U.S. optimized its national marine policy and set up relevant national consultative committee, which explicated the definition of its coastal zone economy and marine economy and establish the management and evaluation system for its marine economy. In the same year, the U.S. government worked out the national marine economy policy aiming at providing a wider communication platform and mechanism which is closely related to modern economy and social information and predict its future development on marine interest relations and trends.

In July of 2000, the America issued its Ocean Law, according to which the national ocean policy research institute –National Ocean Policy Committee was established in 2001 and some other documents such as Marine Stereoscopic Observation System Plan and 21<sup>st</sup> Century marine Development Strategy Plan were successively formulated. Especially in the end of the year of 2004, the United States Marine Policy Committee submitted to the congress a report on marine policy named as 21 Century Marine Blueprint which has made a thorough evaluation of its marine management policy, marking that its ocean development strategy rose to a new height. The blueprint made a comprehensive deploy for maintaining its marine economy interest, enforcing its ocean and coastal protection, establishing

national marine exploration strategy and enhancing its ocean research and education levels. In Dec. 2004, President Bush issued the administrative order to publish the United States Marine Action Plan, which proposed some specific measures for implementing the blueprint. While the 21 Century Sea Power Cooperative Strategy that published in 2007 was regarded as a relatively integrated document about its national policy on sea power development. President Obama subscribed the memorandum on formulating national ocean policy and its implementing strategy, arranging its marine spatial planning which pointed out that ocean management policy must take into consideration the protection of the resources of the sea, coast and big lake regions, the improvement of marine economic activities, coordination of the profit among marine resources users and the sustainable utilization of the resources. All the documents enriched and fulfilled American marine planning system.

Since the 19<sup>th</sup> century, the fact that America is becoming more and more powerful is closely related to its national marine development policy. Without any doubt that 21 Century Marine Blueprint represents the most comprehensive and most thorough formulation of its marine management policy, which plays an important role in advancing national marine policy making the unfolding of series of American marine scheme, policy and procedure.

In the process of American marine management policy development, some issues have been attracted people's attention which influence the orientation of laying down policy on its marine management, such as the expansion of ocean city area being regarded as a challenge; the influence of population increase on agriculture, ocean and coastal areas; and the result of climate change on marine biological resources and their perched zone.

In general, the changing course of American marine policy is complicated but very effective. Firstly, the marine policy committee which was assigned directly by the president is the first action group that pushes forward its marine management policy development. The group, through extensive research and investigation, proposes the preliminary report of the policy. Then the report will be released to public for consultation and the report will be modified and evaluated to some degree. At last, a formal ocean policy report comes into being and is submitted to the congress. The government plays the leading role in the whole process because the government has already realized that its international status is threatened. Thus the determination to review and formulate more strategic marine development policy is a once for ever reform of its marine management policy.

#### **4 The Enlightenment of American Marine Management Policy to China**

The famous American military theorist A. T. Mahan once pointed out that since the beginning of history, a nation's policy on its sea power is the key factor to rule the world and control the sea power which is the primary task if anyone who wants to dominate the world and receive its national prosperity. In human history, there have been many wars fighting for sea power. In today's world, though peace and development have been the theme of current marine management policy, competition and conflict still exist. Especially in 21<sup>st</sup> century when the land resources were exhausted, sea power is becoming more and more important to a country's national power. As a result, the ocean is becoming the hot zone of national territorial control and scramble for resources. As a country of vast ocean region, in the situation of so many conflicts on sea rights and sea interests, how can China establish correct and effective marine policy to protect its safety of the land and sea is really a vital subject that will influence its national further development.

Facing these ocean problems, Chinese government lays down corresponding policy to settle all aspects of dispute and contradiction because protecting national sea rights and interests is necessary to develop and expand its power.

Firstly, sea rights and interests are the determinant of formulating and implementing national marine policy which are the most important components. National marine policy is the action principle for a country to realize its marine task which is determined by its national sea rights and interests and its national sea rights and interests is the starting point and the basis of laying down national marine policy. Our country is in the marine development period and if we want to become a marine economy developed country of strong ocean comprehensive ability, and play more and more important role in international marine affairs, a very significant premise is to take various effective measures to strengthen the marine management. Marine management is the guarantee for smoothly developing marine industry. Secondly, developing marine industry is the ultimate goal of formulating marine policy. Marine Technology Policy, which was published in 1993 as national science and technology blue paper, was the first comprehensive development guidelines on marine science and technology. The formulation and

implementation of blue paper greatly affect national marine policy and advance the national marine science and technology and promote the rapid development of national marine programs. In 1996, China Ocean Agenda 21 by National Oceanic Administration determines the sustainable development principle of marine industry and its strategic objectives, which presents a lot of specific measures to improve and optimize marine industry structure and to develop high-tech industry and clean production. Thirdly, environment protection is the precondition for formulating marine policy. China has adopted management policy of division and cooperation which specifies the role and authority of each department of marine management and environment protection. For now, these measures basically adapt to China's national conditions and play very important role in protecting marine environment and law enforcement.

## 5 Conclusion

The U. S. effective marine management policy has and will continue to give the nation global reach and persistent presence. This strategy reasserts the use of sea power to influence actions and activities at sea and ashore. The explorative character and versatility of maritime management policy provide the United States the superiority of scaling its military presence in areas where access might be denied. The sea is a vast space, where the effective implementation of a nation's marine management policy can be adjusted as conditions dictate to enable flexible approaches to escalation, de-escalation and deterrence of conflicts between nations. The sea power of U.S. is a force for good, which protects its nation's vital interests even it joins with others to promote global security and prosperity. The oceans and waterways of the world are and will increasingly become the domain for building a better world in the future.

It's the necessary strategic choice for a country to go to the ocean to be strong. As a result, all the countries attach greater importance than ever to the strategic position of the ocean. In the 21<sup>st</sup> century, the conflict on international sea rights and interests which centred on striving for marine resources, controlling marine space, has become more and more intense and the rights protection situation that China faced is becoming more and more severe and complicated. Therefore, how to protect Chinese land and sea, defend Chinese sea rights and interests, get on well with neighbouring countries and maintain the peace and order is a very significant subject that we must take seriously.

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## Early Warning Management Mechanism for Fog Navigation Safety in the Three Gorges Reservoir Area

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**Abstract:** In order to remedy the defects of linkage mechanism and improve the operating capability of the early warning to the navigation safety in fog of the three gorges reservoir area, this paper presents the coordination mechanism for early warning to the navigation safety in fog based on HUB model from the aspects of information management, previous warning and control and resource support using the complex network and synergetic theory. On the basis of Hub model, through the coordination and integration of the warning information and safety resources, the dynamic synergetic early warning organization can be realized.

**Key words:** Fog navigation safety; Early warning management; Vulnerability; HUB model; Synergetic theory

### 1 Introduction

Since the water storing of the Three Gorges reaches 135m, the Yangtze River three gorges channel has turn to reservoir channel from natural navigable waterway. The broadening of surface of the river and the retard of the flow velocity helps creating the condition for fog forming. Because fog cut visibility, it's hard to watch navigation mark and other vessels clearly, which may led to maritime traffic accident like collision, stranding, rocking and etc.

On account of early warning management for fog navigation safety in the three gorges reservoir area involves multiple safety management subjects, and the external support system is complex, command coordination mechanism is lack of efficient unity, hence, it's necessary to built a multisystem, multi-sector and multi-unit efficient coordination mechanism of early warning management.

Synergetic do research on synergy effect generated through nonlinear interaction between every subsystem and the mechanism and discipline of the order-disorder transition of system in a certain external condition. Currently, the synergy theory hasn't ever been applied in waterway traffic safety management, but some researchers have proposed the systematic framework, synergy mode and technical support of synergy mechanism of emergency management to city safety (Lin Chong and Zhao Lindu, 2008; Han yu and Chen hu, 2012). This paper innovatively applies synergetic theory into early warning management of water traffic and combine the complex network with coordination management principle, establish the overall process coordination mechanism for early warning management to the navigation safety in fog of the three gorges reservoir area from the aspects of information management, early warning and control and resource support.

### 2 Analysis of Characteristic of Early Warning Management for Fog Navigation Safety in Three Gorges Reservoir Area

#### 2.1 The early warning management system in the three gorges reservoir area

At present, the maritime sector of the Yangtze River has built the early warning management system to the navigation safety in fog of the three gorges reservoir area based on existing water traffic safety supervision organization system, which is shown in figure 1. Thereinto, the Changjiang MSA (maritime safety administration) commands uniformly, manage and harmonize the early warning to the navigation safety in fog. The embranchment in Chongqing, three gorges, Yichang and subordinate marine department and numerous enforcement units which add up to 21, take charge of enforcement of early warning of the areas under their jurisdiction.

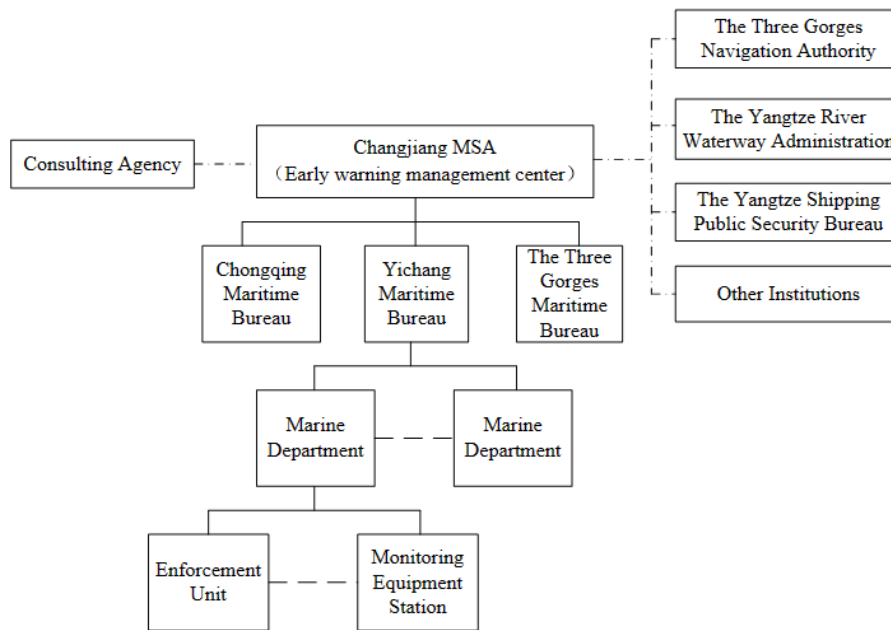


Figure 1 Early Warning Management System of the Three Gorges Reservoir Area

In the process of early warning management, the maritime sector of the Yangtze River implementing early warning management activities according to the early warning information by using security resources to realize the management goal. Early warning information, organization and resource are the three factors of early warning management. In reality, they are not evenly distributed, but gathered in several safety management nodes.

**2.2 The defects of the early warning management system in the three gorges reservoir area**

The early warning management system is a complex multi-factor open system which combines multiple related departments. Since the internal structure and external environment is of complexity, there are lots of leaks and potential safety problems when it runs, the specific performance characteristics are as follows,

(1) The system is very complicated and demanding for acquisition techniques of information of fog. It requires a lot of technical equipments to obtain timely and accurate trends of fog. At present, due to the limited personnel and equipment of meteorological department, and the insufficiency of characteristics and evolution laws of fog in the three gorges reservoir area results in delay and inaccuracy of fog forecasting.

(2) Internal relevance and external dependence of the system is heavy. The effect of the operation is highly demanding for support. The early warning management system contains multiple management units; each unit is interlocked and interacted with the whole system. In addition, normal operation of the system must depend on wide range of security provided by external system, like channel department, fire protection department, public security department, meteorology and etc.

(3) External supporting system attach to different professional system or department, they lack of communication channel between each other which should be real-time, comprehensive and clear. Information sharing among the departments is of low level and only within the scope of their respective duties, lack of efficient unified coordination mechanism.

Therefore, the linkage mechanism of the early warning management in existence goes against the total control of safety information flow, organization and resources. It can't keep to the safety management activities strategically and not integrated operation and teamwork. In the event with more sudden and uncertainty, the fog navigation safety warning management system can't work efficiently.

**3 Analysis of Failure Mechanism of the Early Warning Management Based on Vulnerability**

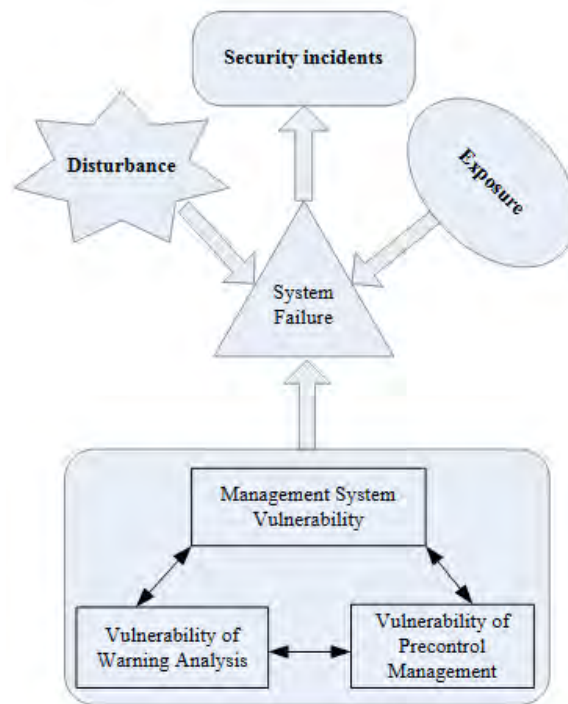
**3.1 The characteristic of vulnerability**

The vulnerability is a kind of natural attributes of system, as an extension of reliability and safety

of a system, to describe inherent defects, weakness and weak links of the system. Or in normal operation or under sorts of effect of random factors, tolerance of interference or failure and the trend and influence it may have when the system can't maintain the normal operation. Vulnerability of management system lies on the management level and the anti-disturbance ability (Han yu and Chen hu, 2011).

**3.2 The failure mechanism of the early warning management**

Failure of the early warning management for navigation safety in fog of the three gorges reservoir area results from congenital defects and the leak of system, there are inherent vulnerability. When exposed to a certain degree of interference that the system can't resist, it will lead to all or part of the functions lost of the system, or can't meet the warning requirements, leading to shipping accidents or deterioration of the event. Theoretically, interference, exposure and vulnerability constitute the causes chain of failure of the early warning management system. It's the consequence of combined action of the three factors, none is dispensable. Therefore, only when the interference and exposure exceed a certain threshold, management system will turn to failure.



**Figure 2 Failure Mechanism of the Early Warning Management System**

From the point of view of the safety management, interference and exposure is the factors of environment system, strong uncertainty and unpredictable of specific characteristics make it low degree of controllable and the early intervention is difficult. Fog in the three gorges reservoir area is of strong sudden, its form, scope and the variation are difficult to know accurately. While vulnerability is the build-in attribute of early warning management system for fog navigation in the three gorges reservoir area, by repairing security flaw and defects of the system, the condition of the vulnerability of the system can be obviously improved.

**4 Synergy Mechanism of Early Warning Management for Fog Navigation Safety in Three Gorges Reservoir Area**

**4.1 Hub node model of early warning management**

HUB is the node with large numbers of network connections; its amount and value express the radiation of network. It has significant impact on vulnerability and robustness of network.

HUB mode (shown as figure 3) of early warning management in the three gorges reservoir area is to add HUB into the traditional warning management network, integrate the originally dispersive alert information, organization and resources and then form an integrated and transparent multi-level management network of warning for fog navigation to achieve the unified coordinated optimization of

warning information, organization and resources.

According to the organization structure and level distribution of the warning management in the three gorges reservoir area, the system can set a level 1 HUB, three level 2 HUB and several level 3 HUB, to realize harmony management from upper, middle and low level respectively. As is shown in figure3, in the early warning HUB mode, M1, M2... M13 are safety management nodes, H1 is level1HUB, H2, H3, H4 are level2HUB, H5, H6, H7, H8 are level3 HUB.

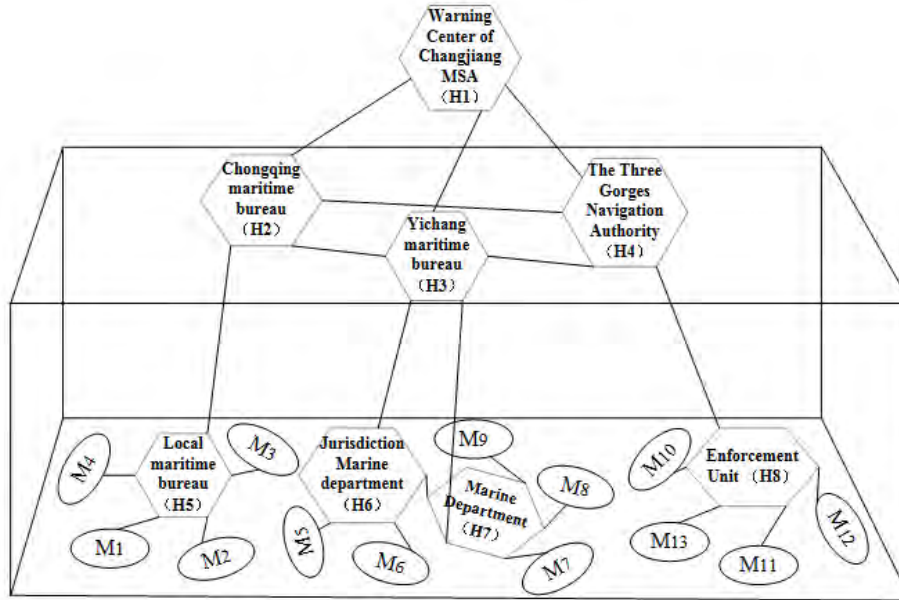


Figure 3 HUB Mode of Safety Management for Fog Navigation

In coordination mechanism, HUB work for sharing, coordinating and transferring. When security incident occurred, the directly related safety management node transmit alert information which is synchronous change with progress of the event at the same time when it response to the management task. Transfer the information to all safety management nodes gradually through HUB network by sharing and make the warning information access for all. HUB at all levels coordinates early warning management organizations between levels according to the alert information, transfer the required safety resources to the terminal safety management node via the optimal path selection though HUB, in order to realize the coordination of early warning management system.

**4.2 Synergy mechanism of early warning management for fog navigation**

**4.2.1 Information management mechanism**

Early warning information management mainly includes collection and transmission of early warning information, early warning information processing and releasing. Collaboration of early warning information is the important basis and prerequisite of coordination mechanism operation. In the early warning management network, the safety management node is the primary source of information and the final destination. The early warning information of each node firstly converges to the lowest HUB, then step-up to the upper HUB. After the real-time analysis and processing and top-down transmission, information is eventually delivered to various safety management nodes by level 3 HUB again. Thus information synergism can be achieved via dynamic interaction of information between safety management node and HUB mutually. Rapidly transmission and linkage of early warning information between each management unit and the transparency and sharing of information can promote the efficiency of security organization and the utilization of security resources.

**4.2.2 Early warning and control mechanism**

According to the maritime management organization settings in the three gorges reservoir area and the Hub node model of early warning management for fog navigation, the early warning mechanism which is 2 level early warning and 3 level network publishing can be built. According to the urgency, danger level and coverage it may cause to the water traffic safety and environmental safety, the mist navigation warning is divided into two levels, viz level 1 (red), level 2 (orange). Early warning information is delivered from the level 1 HUB, Yangtze River maritime bureau to level 2 and level 3

HUB, related branches of the maritime affair bureau, and release cooperatively with authority. Furthermore, a comprehensive multi-sector and multi-system security threat warning system and decision support system and also an effective communication and early warning sharing mechanism should be established, so as to share and transfer the early warning information timely.

There is no need to set special executive department for pre-control execution. On the basis of the existing water traffic safety management department, set up warning and control coordination station in departments like maritime, public security and fire control, channel, correspondence and regional government respectively. Thus the coordinative management and control can be implemented initiatively under the command of the leadership with mutual coordinate communication.

#### 4.2.3 Resources guarantee mechanism

Resources guarantee mechanism plan and coordinate the emergency resource of the network-wide with grading, level and classification through HUB. When a navigation safety event takes place, the HUB in vicinity transfer resources of the security management node directly connected with it in timeliness principle. Meanwhile, transfer the resources demanding information to security management node all over the network collaboratively and prepare the subsequent resources which are available according to the estimated development situation. As events unfold, when the resources that the preferred HUB can schedule is insufficient, the rest of HUB can supply resources, and then assemble resources to the security incident point. Resources of the external support system converge gradually through various levels to the HUB, after global optimization then distributed to all level layered safety management node. Thus, the coordination, scheduling and whole planning of the resources all over the network can be fulfilled.

## 5 Conclusions

This article analyze the characteristics of early warning management for mist navigation safety in three gorges reservoir area from the point of view of vulnerability, argues that vulnerability is the cause of failure of management system, the hinge of the early warning management in three gorges reservoir area is to improve the vulnerability of the system and their own security ability. At the same time, structure the early warning management coordination mechanism for mist navigation safety from the aspects of information management, warning pre-control, resource security on the basis of complex network and coordination management.

Along with the growing of ship flow in three gorges reservoir area, the fog navigation safety management is faced with even more complex navigation environment. How to carry out comprehensive, round-the-clock and real-time monitoring using advanced technology and equipments and master the dynamic ship movements and the situation of fog accurately and timely, providing decision support for early warning management, in order to improve the pertinence and effectiveness of early warning management still deserves further study.

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# An Analysis of Price Elasticity of Demand for Energy Sector in Dominican Republic

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**Abstract:** For the development of countries economy, great investment decisions must be made every year about what shall be done, what shall be invested, what shall be prepared for future. No sector of the world economy or industry feels this more profoundly than energy. The study is firstly conducted to have an overview of the Electricity Sector of Dominican Republic, and describe important issues on the current sector reform, that still in process among Latin American countries. Secondly, the paper aims to determine the elasticity of demand on energy generation sector, through the log linear regression method on variation of price and quantity of demand. Related researches concerning Elasticity of demand in other countries, as Australia, Israel and United States, shows close similarity of our result, where the elasticity tends to be inelastic (0.57) but not perfectly inelastic to variation on price. Although the complexity of the Energy market structures by sectors, Customers' response to pricing signals can promote efficient investment (in the long run term), help mitigate short-run market power by generators and transmission owners, reduce price spikes, lower price volatility and reduce customers' bills.

**Key words:** Price Elasticity of demand; Electricity Responsiveness; Energy Pricing; Problems of Power Industry

## 1 Introduction

Energy sector plays a determinant role on economy's growth and quality life of nations. The power sector in the Dominican Republic has traditionally been, and still is, a bottleneck to the country's economic growth. According to the World Bank, the revitalization of the Dominican economy depends mainly on a sound reform of the sector. Energy production, transmission, and distribution operate on a massive and pervasive scale, and take years -often over a decade- to design, organize, finance, build, and operate.

Power sector reform has been widespread throughout Latin America and the Caribbean. It introduces comprehensive reforms aimed at opening the sector to private participation and competition. With only a few exceptions, lack of efficiency incentives and tariffs that did not reflect actual costs led to the poor performance of state-owned enterprises (SOEs), which accumulated huge financial deficits. This paper aims to determine the elasticity of demand on the generation electric sector, through the variation of price and quantity of demand. We have seen closely similarity in the structure of market, but we will try to situate and focus on the factors that characterize the Energy sector of Dominican Republic, as a developing country.

## 2 Literature Review

For nearly a century, the whole electricity sector has been thought of as a "natural" monopoly industry, where efficient provision requires a regulated public or private monopoly. Most utilities have historically met their obligations by jointly providing the four primary electricity supply functions: generation, transmission, distribution and retailing. The generation segment of this industry involves the creation of electricity using different technologies (e.g., falling waters and steam turbines powered by fossil fuel). The transmission of electricity involves the use of wires, transformers and sub-station facilities to "transport" electricity between generation and distribution centers, which includes the interconnection and integration of generating facilities into a synchronized network.

This function includes i) scheduling and dispatching generating facilities to balance demand and supply (in real time) and ii) management of equipment failure as well as network constraints. Finally, the distribution and retailing functions are related to the final distribution of electricity to residential and business consumers at relative low voltages. The former requires the use of wires and transformers along and under streets to get to customers, and the latter involves retailing functions which include metering, billing, making arrangements for supplies of power from generators, and other demand management services. Typically, retailing and distribution have been viewed as integrated functions.

According to economic theory, on a free market electricity demand will fall as the energy price increases, holding all other factors constant. The consumer's sensitivity to price changes can be measured by the

coefficient of price elasticity – the percentage change in demand divided by the percentage change in price. Customers react to changes in prices that they see by adjusting their desired quantity of demand. As prices rise, customers will reduce the quantity demanded. As prices drop customers will increase the quantity demanded.

### 3 Data and Methodology

The study is conducted firstly to have an overview of the Electricity Sector of Dominican Republic. Important issues to considerate are the in-process sector reform, which might has an important impact in the short and long run of the economy development. Likewise we will analyze the electricity supply, installed capacity, principals sources for energy production, the quantity of demand, principal’s obstacles and problem on energy losses, among others issues.

In addition, we took into consideration the fluctuation of price and quantity demand in order to determine the price elasticity of demand. We looks for investigate the hypothesis of “though the electric market is an inelastic market by definition, is not perfectly inelastic; and the responsiveness of customer on demand play a role for the regulation and efficiency of market”. We used historic data from the National Energy Commission (CNE), Superintendence of Electricity and the 3 distribution-retailing companies (Edesur, Edenorte and Edeste). Likewise we used the CPI USD index of the World Bank database in order to deflate Electricity Price, and then apply log regression method to find out with more precision the Price elasticity estimation.

#### 3.1 Case description

Dominican Republic, like many countries in Latin America, ahead of final 1990's a process of reform of electricity subsector to solve problems associated with high generation costs, energy rationing and inefficient management of a vertically integrated state monopoly. The reform introduced a market model with private participation and regulation independently, maintaining hydro generation and transmission in the hands of the state.

On early 2001 The reform was modified with the capitalization of private investors of 3 new distribution companies and 2 thermal generation companies, which resulted from the restructuring of the Dominican Electricity Corporation (CDE), the state monopoly, the creation of the Superintendence of Electricity (SIE) and the Commission National Energy (CNE), independent bodies responsible for regulation and policy formulation, respectively. General Electricity Law came into place giving the regulatory and institutional framework. The process had difficulties due to: substantial rise in international oil prices, political difficulties to transfer electricity rates rising production costs in a generation system approximately 85% dependent on imported fuels, inability to reduce commercial losses of electricity and improve the collection in sustainably, and macroeconomic imbalances that caused a devaluation and accelerated inflation.

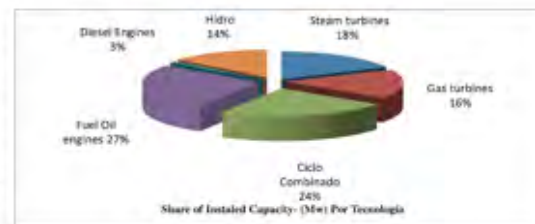
#### 3.2 Electricity supply

The Electricity Generation in the Dominican Republic network is produced from Steam turbines, Gas turbines, diesel and fuel oil engines (mostly by imported oil or liquefied natural gas); and other important portion by hydroelectricity and combined cycle. At the end of 2006, total installed capacity of public utilities was 3,394 MW, of which 86% was thermal and 14% was hydroelectric . The installed capacity for every technology is as follow:

**Table 1 Installed Capacity by Technology as of Dec-06**

Technology	Instaled Capacity-Mw	Percentage-%
Steam turbines	606.2	17.9%
Gas turbines	572.7	16.9%
Combined cycle	804.0	23.7%
Fuel oil engines	912.0	26.9%
Diesel oil engines	30.0	0.9%
Hydroelectricity	469.3	13.9%
<b>Total Instaled Capacity</b>	<b>3,394.2</b>	<b>100.0%</b>

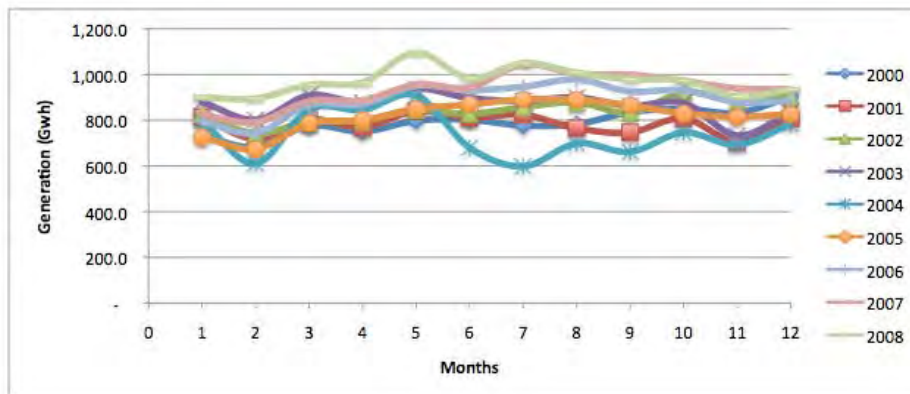
Source: Operations Coordinating Agency Report



Currently, there are plans for the construction of two 600MW-coal fired plants, Montecristi and Azúa, by the private sector. It is also expected that, by 2012, an additional 762MW of hydroelectric capacity will have been added to the generation system. Total electricity generated in 2006 was 10.7 TWh. Generation experienced a 7.7% annual increase between 1996 and 2005. However, between 2004 and 2006, there has been an average annual decrease of about 10% in total electricity generated.

#### 3.3 Electricity price and demand

Electricity demand in the Dominican Republic has grown considerably since the early 1990s, at a yearly average of 10% between 1992 and 2003. Consumption is very close to the regional average, with annual per capita consumption of 1,349 kWh in 2003. Total electricity sold in 2005 was 3.72 TWh. Demand has constrained supply, which in turn is limited by subsidies.



**Figure 1 Net Electricity Generated Curve (Gwh)n**

Electricity tariffs in the Dominican Republic are among the highest in the Latin American and Caribbean region. The reason of this is cause from several factors: Dependence on imported oil, weak institutional environment, difficulties to pursue large non-payers, high prices negotiated in power purchase agreements with the generators, high commercial risks faced by generators such as non-payment or delayed payment by the distribution companies and/or the government, low cash recovery index (CRI), and high operating costs in the distribution companies.

The country's policy of cross-subsidizing residential tariffs by disproportionate increases in commercial and industrial tariffs translates into higher rates for industrial and commercial consumers compared to residential consumers. For example, in 2007, the average residential tariff was US\$0.160 per kWh (LAC weighted average was US\$0.115 in 2005), while the average industrial tariff was 0.230 (LAC weighted average was US\$0.107 per kWh in 2005) and the average commercial tariff was as high as US\$0.290 per kWh.

**Table 2 Ponderated Tariff of Electricity (US \$/Mwh)**

Year	Months	Nominal Price	Price CPI
		US \$/Mwh	US \$/Mwh
2007	May	105.42	105.42
	Jun	112.28	112.06
	Jul	115.75	115.56
	Aug	121.88	121.90
	Sep	105.42	105.15
	Oct	124.20	123.61
	Nov	136.07	134.63
2008	Dec	136.07	134.72
	Jan	144.08	141.94
	Feb	161.07	158.22
	Mar	158.61	154.47
	Apr	165.66	160.36
	May	173.35	166.40
	Jun	190.42	180.96
	Jul	208.11	196.74
	Aug	234.33	222.42
	Sep	216.66	205.93
	Oct	187.23	179.77
Nov	136.69	133.81	

	Dec	91.19	90.20
2009	Jan	86.09	84.79
	Feb	101.33	99.30
	Mar	105.23	102.88
	Apr	99.50	97.03
	May	109.76	106.73
	Jun	128.03	123.43
	Jul	143.46	138.53
	Aug	143.10	137.87
	Sep	155.42	149.65
	Oct	151.36	145.60
	Nov	157.19	151.10
	Dec	165.42	159.29
2010	Jan	161.08	154.58
	Feb	165.77	159.05
	Mar	162.62	155.39
	Apr	162.52	155.02

As we mentioned, we used the Consumer Price Index for USD from the World Bank Database. This enables to make sensible comparisons across time periods even as prices move, due to inflation. With this in mind, the elasticity of demand equation can be converting from:

$$\varepsilon = \frac{\% \Delta demand}{\% \Delta price} = \frac{\Delta q / q}{\Delta p / p} \tag{1}$$

$$\varepsilon = \frac{P}{Q} \times \frac{\delta Q}{\delta P} \tag{2}$$

In other way, we substitute Elasticity for the next equation:

$$\frac{1}{Q} \times \frac{\delta Q}{\delta P} = \varepsilon \frac{1}{P} \tag{3}$$

From this derivate equation, we can convert it into a linear model:

$$LnQ = \varepsilon LnP + b \tag{4}$$

### 4 Results

The results obtaining the Price Elasticity of demand for the electric sector is showed on the following table. We may note that R Square rounds in 99.98%, which shows that the coefficient € (elasticity) has strong approximation on the linear regression equation.

**Table 3 Result of Linear Reg. Equation**

Linear Regression						
<b>Regression Statistics</b>						
R		0.9998084157				
R Square		0.9996168682				
Adjusted R		0.9996168682				
Standard E		0.1381271087				
Total Numt.		20				
<b>A = 0.5792 * B</b>						
<b>ANOVA</b>						
	d.f.	SS	MS	F	p-level	
Regression	1	945.7945240216	945.7945240216	49,572.2867402625	0.E+0	
Residual	19	0.3625028648	0.0190790981			
Total	20	946.1570268863				
	Coefficients	Standard Error	LCL	UCL	t Stat	p-level H0 (2%) rejected?
Intercept	0					
B	0.5791790739	0.0026013176	0.5725730714	0.5857850763	222.6483477151	0.E+0 Yes
T (2%)	2.5394831906					
LCL - Lower value of a reliable interval (LCL)						
UCL - Upper value of a reliable interval (UCL)						

The overall price elasticity in Dominican Republic, estimated by using the historical data is 0.57, showing a moderate responsiveness of electricity consumption to changes in prices. This level of responsiveness for Dominican Rep. has an adequate similarity to the elasticity of other countries of our literature review. For example the research made by Dr. Fan and Hyndman<sup>(13)</sup> conclude that South Australia rounds about  $-0.036 - 0.43$ ; Israel rounds from  $-0.02 - 0.58$ ,  $0.002 - 0.44$  for residential and industrial sector respectively. Likewise in USA rounds in  $-0.2$  for the short run and  $-0.70$  for the long run in the residential sector. Nevertheless, in the short run we can observe that in peak months of summer, the absolute value of elasticity decrease to 0.18, (2008) in relation with previously months. It could be attributable to the weather condition (high temperature).

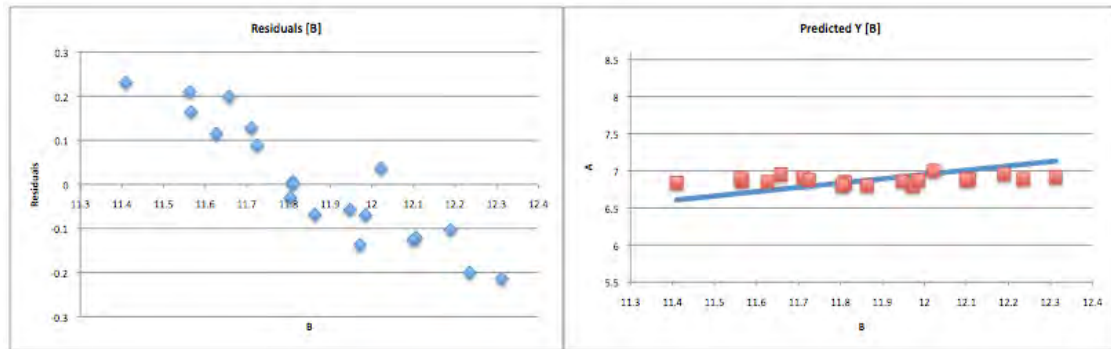


Figure 3 Residual and Log n Equation Graphics

## 5 Conclusion

Dominican Energy Sector is affected by high dependence on petroleum for electricity generation, financial crisis of the distribution companies, lack of investment, non-payment of the purchase of energy, high unmet demand, higher tariffs and subsidies, electricity non-payment culture, and high losses in commercial energy, among others. Although significant progress has been made about it, those factors still are an impediment on economy growth.

We can note the similarity of the consumer responsiveness in the variation of price for different countries (from 0.40 – 0.60 in log run). We observe that, even different conditions, it does not represent a higher gap of discrepancy. It may allow us to say that while the market framework tends to have a low level of price elasticity- because high cost of substitutes- no necessarily is a perfectly inelastic market. Furthermore, this responsiveness can be an important indicator for energy suppliers, especially the generation sector rather than transmission and distribution.

When the customers do not react to market prices, all pricing mechanisms are left in the hands of the market suppliers. In the presence of competition, the suppliers will, on their own, be unable to raise prices above the production cost of the least efficient unit in operation. In this competitive situation the market price will adequately reflect the production costs. The reacting of customers to pricing signals (demand response) in the electricity marketplace can promote efficient investment (in the long run term), help mitigate short-run market power by generators and transmission owners, reduce price spikes, lower price volatility and reduce customers' bills.

Lack of demand response also increases the ability of electricity suppliers to exercise market power and raise prices. In order to achieve efficiency in the marketplace, prices should reflect the cost of the good. Market power contributes to price volatility and price spikes observed in today's electricity markets, including Dominican Republic. An alternative may be the transition to Renewable Energy, such as solar PV grid, wind, biomass, etc; that will reduce the oil import dependence, green house gas emission and will promote the environment conservation. This will require a deeply study to determine whether what may be the best alternative, relatively to cost investment on Dominican economy and when is the appropriated time for implementation.

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## Analysis of the Status Quo and Improvement of Sports Consumption by the Elderly in Wuhan Urban Area of China

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**Abstract:** This paper analyzed on sports consumption status of the elderly of Wuhan urban area by applying documentation method, questionnaire method, and mathematical statistics and analysis method. It's found that improving spirit, adjusting mood and spiritual longing accounts for very big proportion in sports consumption motives of the elderly; in sports consumption structure, they emphasizes on material consumption; their consumption ability have direct proportion with income. This paper further proposed the following market development strategies: strengthen and guide the consumption awareness of the elderly; construct and reasonably use stadium and gymnasium; improve the government's attention; cultivate professional talents on serving the sports consumption of the elderly.

**Key words:** Wuhan Urban Area; The Elderly; Sports Consumption; Market Development Strategies

### 1 Introduction

As per the standards of UN on classifying the country of aging population: the countries or regions with the elderly of 60 years old or above account for 10% of the total population, or with the elderly of 65 years old or above account for 7% of the total population, then such countries or regions are called aging countries or regions<sup>[1]</sup>. According to the press conference on the aging population info of Wuhan City, the total population of the registered permanent residents of Wuhan City was 8.2724 million ended 2011, and the negative growth rate was 1.13%. The whole city had 1.3205 million of the elderly above 60 years old, accounting for 15.96% of the total population. It shows that there's one old people in every 6 residents of Wuhan City. Wuhan City has entered rapid development stage of aging population<sup>[2]</sup>.

Confronting with such huge the elderly consumption market, there's only few businesses among numerous that seized this opportunity. Sports exercises can promote the physical and psychological health of the elderly, prevent disease and cure diseases, and let the elderly keep exuberant energy. So sports consumption has become an important content of the daily sports and cultural life of the elderly. China has huge sports consumption market for the elderly, and its potential and prospective earnings cannot be underestimated.

The study on the development of sports consumption market is the vital aspects of the development of sports industry. Seen form the study conditions of the current China, there're 306 articles (referred to China's periodicals website for 20 years) on elderly consumption, the earliest research was in 1994; there're 33 articles that study on the sports consumption market development for the elderly, and the earliest was originated in 1998; there's no study on sports consumption market development for the elderly of Wuhan City. Therefore, this paper studied on the development countermeasures of such market basing on sports consumption status of the elderly of Wuhan City.

## 2 Sports Consumption Status of the Elderly

### 2.1 Consumption motives

According to the investigation on sports consumption motives of the elderly, health, prevention and cure diseases and spiritual longing account for a large proportion. Various factors may bring sense of loss and sense of loneliness to the elderly after their retirement, which require them to change their living mode, continuously adjust themselves and seek spiritual longing. Moreover, the elderly may more or less have some chronic diseases. Currently the majority of the elderly regard health as the first priority, then it's successively social contact, recreation and entertainment, others and athletic ability. For preventing disease and pursue "prolonging and lengthening life", the mass old people turn their view to sports consumption integrating recreation and fitness as a whole.

**Table 1 Sports Consumption Motives of the Elderly of Wuhan City (multiple choice) N=817**

Motives	Health	Recreation	Spiritual Longing	Athletic Ability	Social Contact	Preventing Disease	Others
Population	632	85	291	19	182	320	45
(%)	77.3	10.4	35.6	2.3	22.2	39.1	5.5

## 2.2 Consumption Consciousness

Those who hold positive attitude on sports consumption accounts for 95.8%, believing that “sports consumption is very normal, and it’s worthwhile to spend money for health”. Study shows that: the elderly with high education level have relatively high cognition on the social and economic benefits of sports consumption, so their sports consumption awareness is higher than those with low educational level. 573 old people have different investment on sports consumption, accounting for 70.1% of the total. Meanwhile, 25.7% of the elderly hold positive attitude on sports consumption, but have no actual consumption behavior. Such proportion of old people have the consumption willingness, who temporarily do not participate in consumption because of economic or other reasons. Only 4.2% of the elderly hold negative attitude, believing that “sports consumption is a waste” or “have no interest in sports consumption”

## 2.3 Consumption Structure

Investigation shows that in sports consumption structure of the elderly of Wuhan City, material consumption is emphasized, which has reached 83.3% in frequency. Then it’s participatory consumption, which accounts for 25.7% in frequency. Appreciation type and game type respectively accounts for 10.5% and 9.5%. It’s worth noticing that in game type consumption and material type consumption, there exhibits two totally different trends between the elderly who have RMB 501-1500 yuan of monthly income and the elderly with above RMB 1501 yuan of monthly income. The former’s consumption frequency in game type is 32 and material type consumption frequency is 77. They are obviously higher than the elderly with relatively high income level in game type consumption, while their material consumption is obviously low, which has close correlation with their income level and financing mentality.

**Table 2 Construction Structure of the Elderly of Wuhan City N=817**

Construction Type	Material Type Consumption	Appreciation Type Consumption	Participatory Type Consumption	Game Type Consumption
Frequency	681	86	210	78
Proportion (%)	83.3	10.5	25.7	9.5

**Table 3 Monthly Income Status of the Elderly of Wuhan City N=817 Unit: RMB yuan**

	Below 500	501—1000	1001—1500	1501—2000	Above 2001
Population	63	197	246	237	74
(%)	7.7	24.1	30.1	29	9

## 2.4 Consumption Capacity

Investigation results shows that sports consumers of the elderly who consume less than RMB 100 yuan yearly accounts for 14.68%, those between RMB 101-500 yuan accounts for 58.98%, and those above 501 accounts for 19.33%. Seen from the general situation, the performance of the elderly in sports consumption shows: both ends low while the middle is high. Such form is in conformity with the monthly income status of the elderly, which matches with the relations (direct proportion) between income and consumption. Their sports consumption are mainly for health care, exercise at charging places, and purchase clothes, shoes, hats and fitness equipment, etc. of which, purchasing sports health care products occupied large amounts. Currently, the general economic development level of Wuhan City is limited, the physical and cultural living level of the elderly is still not high, and their expenditure on various cultural entertainment and sports activities would not be much, therefore, the sports consumption level of the elderly is not high, which is normal. With the social and economic development, especially the continuous development of sports industry of Wuhan City, the sports consumption level of the elderly would have a relatively big development.

**Table 4 Annual Consumption Capacity of the Elderly of Wuhan City N=817**

Amount (RMB)	Frequency	Percentage (%)
No Consumption	53	6.48
Below 100	120	14.68
101 — 200	144	17.62



201 — 300	206	25.21
401—500	132	16.15
501—800	93	11.38
Above 800	65	7.95

### 3 Influence Factors

According to investigation, the most influencing factor of sports consumption of the elderly is consumption concept, which reached 47.7%. Personal sports consumption concept is plain and thin, Chinese people have the concept of "make ends meet with small surplus" and "save money first and then consume" formed by self-contained economy for a long time, which resulted in the consumption mode and consumption concept of the elderly have distinct differences with that of western developed countries. Just such thrift and hardworking concept has been the restraint for the elderly to pursue consumption desire and seek higher level enjoyment. Meanwhile, primary stage economic development level also decides that the elderly firstly pay attention to health care consumption, those with relatively backward sports consumption, even with relatively high income, often pursue "big" and "luxury" in sports consumption. They go to pay sports site for exhibiting body and pursuing fashion, who seldom pay attention to the true value of fitness. So they would ignore sports as the right that the elderly should enjoy to pursue health. Sports should become the life-time need of the elderly and the eternal demand of the whole people. (Senior citizens' work committee of Wuhan City. <http://www.whllw.gov.cn/text.asp?id=838>)

Whether the perfection of sports site and facilities would also become the important elements of restraint has reached 35% of the influencing factor, ranking the second. Currently, the sports sites of Wuhan City has increased to 7351, the area of sports site per capita has reached 1.32m<sup>2</sup>. Although it surpasses the index of 1.08m<sup>2</sup> per capita for creating national civilized cities, as compared to the 4m<sup>2</sup> of sports site area of the developed countries including Japan, France, America, etc, it has a great gap, which cannot meet people's sports consumption requirements, thus it restricts the increase of sports consumption<sup>[3]</sup>. (Wuhan Sports Bureau. <http://www.whsport.gov.cn/content.jsp?id=3882>)

## 4 Development Countermeasures on Sports Market of the Elderly

### 4.1 Use high level cultural thought to influence the value orientation of the elderly, and guide the aging population to carry out healthy and conducive sports consumption

Reasonable and right sports value concept and active and stable sports attitude are the important factors for promoting the elderly to participate in sports activities. The sports behaviour of the elderly originates from their demand on sports. It needs to trigger their motives, which can result in target selection. Then under certain scene role, it can generate behaviour. Positive sports attitude has promotion role on personal sports behaviour, negative sports attitude has impeding role on sports attitude. Strong and distinctive sports attitude is the main factor for people to overcome various difficulties and insist on sports exercises, thus long-term sports consumption can be attained<sup>[4]</sup>.

Currently the sports consumption of the elderly of Wuhan City is mainly the consumption on various sports goods, while the consumption on various sports service consumables is not common. Although such sports consumption structure valuing material while ignoring service is correlated with the income of consumers per capita, it has certain relations with traditional consumer awareness and consumption habit. Currently China is entering moderately prosperous society, more and more people have the ability to consume various sports service goods. We should seize this opportunity and strengthen publicity strength, so as to lead the transition of sports consumption from material type to non-material type.

### 4.2 Increase the construction on sports infrastructure and reasonably use existing stadium. Moreover, we should attach importance on enhancing the openness of sports sites which are suitable for the activity characteristics of the elderly

As per the requirements on civilization construction work of the whole city, the relevant departments should enhance the construction strength of stadium. It's estimated that the newly increased area of sports site of the whole city will reach 0.2 million m<sup>2</sup> in 2012. Various stadiums should speedy the transition to operation style, so as to make the limited sports facilities be used reasonably. It can execute enterprise management, gradually attain compensated use, operate independently and assume

sole responsibility for its profits or losses. Build sites convenient for residents to do exercises at compact communities, meanwhile, encourage school, enterprises and public institutions to open the existing stadiums to the public, and equip with corresponding social sports instructors. While strengthening the construction on stadiums, the government of Wuhan City should encourage social forces including enterprises, collectives and individuals, etc to build various public places of entertainment through providing preferential policies. Achieve the diversified investment mode and use economic measures and market rules to utilize sports facilities, so as to build benign circulation operation mechanism of self investment and self benefit.

#### **4.3 The government should improve attention, emphasizes on social benefits, supervise and adopt award measures so as to cultivate the social responsibility of operators**

Indeed, sports products of the elderly should face the market under market economic conditions. It should attach importance to market demands and expand the operation channels as per requirements, so as to obtain good economic benefits, expand economic strength and achieve continuous development in market economy. However, in the the development of sports industry of the elderly, it's permeated with welfare factors. Such industry particularly has more the dual nature of spiritual products and material products. Therefore, we should not pursue the maximum profit as the target like other products, while ignoring social responsibilities. The development of such products should not only follow economic rules, but also attach importance to social benefits and serve the demands of the elderly. So the social responsibility scope of sports industry of the elderly should be clearly defined, and it should be combined with supervision and award to cultivate the sense of social responsibility of operators, so as to make the operators know that only the elderly are able to obtain true benefits, can sports industry of the elderly have existing significance.

#### **4.4 Reform the existing sports scientific research institutions and cultivate sports operation talents of the elderly**

We should vigorously support and develop scientific research institutions on sports industry of the elderly, encourage the commercialization of the technical achievements of scientific research institutions, adapt to scientific research enterprises integrating R & D, production and trade, execute the operation mechanism of self operation, assuming sole responsibility for its profits or losses through self development and self restraints, and develop scientific research enterprises. Meanwhile, we should strengthen the investigation, study and theoretical discussion on China's elderly sports industry, so as to pave the way theoretically. Moreover, we should vigorously cultivate the operation talents on elderly sports, create a talents team who can not only understand the sports rules, operation and management of the elderly, but also are familiar with various laws, international conventions and financial settlement and estimation, which is a long-term matter of fundamental importance in developing sports industry of the elderly.

## **5 Conclusions**

The majority of the elderly of Wuhan urban area have positive attitude on sports consumption. In sports consumption structure, they lay particular stress on material consumption, which has close correlation with income level. The sports consumption behaviour of the elderly shows diversified characteristics, the first demand on sports consumption is "health", the second is "preventing disease", the third is "spiritual longing". When approaching the development of sports consumption market, we need to correctly guide the consumption view of the elderly, strengthen publication strength and lead sports consumption achieve the transition from material type to non-material type. We should attach importance to the development and utilization of sports field which can meet the sports consumption demand of the elderly, perfect diversified operation measures on existing social sports facilities, form the benign circulation operation mechanism of self investment and self benefit. Moreover, we should enhance the governmental supervision strength, and hold encouraging attitude on the development of this "silver industry", and promulgate pragmatic policy on awarding or preferentially treating relevant operators. We should not only follow economic rules, but also emphasize on social benefits. It can serve the needs of the elderly, and meet the economic benefits of merchants and cultivate the sense of social responsibility of operators. We should vigorously cultivate the operation talents on elderly sports, create a talents team who can not only understand the sports rules, operation and management of the elderly, but also are familiar with various laws, international conventions and financial settlement and estimation.

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## Multi Dimensions of Proximity and Their Interaction and Impact on Regional Innovation: The Case of Matsue Ruby Project

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**Abstract:** This paper discusses the formation of networks and the types of proximity that comprise the foundation of regional industry promotion in peripheral areas. Anecdotal surveys and analysis of the networks in a typical peripheral area are utilized, in a region where the typical multilayer elements that include geographical proximity and the compound effects of these elements do not exist.

**Key words:** Proximity; Innovation; Network; Ties

### 1 Introduction

In the past, according to Seki (1995), Japanese economy had grown up with a “full set mode” of manufacturing. The metropolitan industrial agglomerations had specialized in prototype creation, while the regional industrial areas had functioned as low cost and mass production bases. However, in the last few decades, the situation surrounding industrial structure has dramatically changed, because of globalization, domestic economy slump, high yen and other irresistible trends worldwide. The regional industrial areas have heavily suffered from this structural shift, and the local governments have struggled to overcome accelerated hollowing out of their manufacturing foundation for sustainable regional economy. The regional economies came to realize the accumulated knowledge were mainly about effective mass production which were useless in the absence of large manufacturing plants, but not about innovation driving endogenous growth. While regions are now competing to attract firms to invest in by offering luxury financial incentives, the true cost of luring plants from outside must be quite high nowadays and sometimes the cost might be far exceed the benefit they would enjoy (Kotler and Gertner, 2011), as firms can choose a location from global perspectives.

Meanwhile, Japanese government strongly initiated the regional-industrial promotional policies, following the industrial cluster framework proposed by Porter (1998) for resolving fragmentation in regional economies and reshaping the economies into autonomous and innovative ones, breakaway from mass production factory centered economy. Thus, the policies have been designed to help regional small and medium-sized enterprises (SMEs) as a whole better respond to many factors that cause market instability, such as the globalization of the economy, by achieving flexible specialization among them. However, these policies implicitly assumed that regional economies have, at least to some extent, existing base of target industries (e.g. accumulation of human resources) and research and development facilities. Then what would be happened if all municipalities spontaneously rushed to pick up winners? And how can peripheral regions, which are not with the industrial infrastructure, compete with more developed areas? Moreover, owing to the rapid development of ICT, network relationship observed in the business world has become more complex and global. While the geographical economy literature including Porter insists the economies of agglomeration in an industry cluster, the sharp rise of collaborative activities taking advantage of virtual network casts serious doubts on the benefits of geographical agglomeration itself, or at least implies the decline of the economy. In a nutshell, it is difficult challenges than ever for peripheral regions to transform themselves into successful innovative areas almost from scratch and achieve competitive advantage, especially with high tech industries even if possible.

We sympathize with Hospers et al. (2009), which argues policymakers should start from ‘Regional Realism’ rather than to try to build the next Silicon Valley and take ‘do-not-harm’ approach, but the only lesson ‘do-not-harm’ approach gives policymakers of peripheral regions is “sleep and wait for good luck” or, at the worst, “waiting to die” since their realism are almost empty. The policymakers there should either accept the reality or create peculiar scheme reflecting global competition and virtual network.

Matsue city, the capital city of Shimane prefecture which is a typical peripheral city in Japan, then in tandem with the prefecture, has initiated a regional IT industry promotion project since 2006 built around the emerging open source programming language Ruby. Shimane prefecture at least on surface

was loser even in the domestic competition. The only potential advantage it preserved at the beginning was that the star programmer, who had created Ruby and been embraced in the virtual community spreading across the globe, lived there. It has been suggested that the geographical proximity of related actors in a region profoundly influences regional industry promotion, as summarized by Huggins and Johnston (2009). In contrast, in this regional promotion project, the network of actors has extended outside the region. Therefore, actors in the region of Matsue City know about their own interests in the area and a certain amount of ‘activations’ of the project, which has led to its success. It has further been suggested that many types of elements exist, comprising geographical proximity and other items, which combine to produce compound effects. Therefore, this research aims to determine which elements are effective in regional industry promotion in peripheral areas and the mechanisms of how these elements are carried out. To do so, we investigate the networks and types of proximity that form the foundation of industrial promotion activities

## 2 Previous Works

### 2.1 Proximity and innovation

Porter (1998) expands the concept of innovation by geographical density based on the definition of a cluster, which is a group of companies and related institutions that are located within a geographically close area. Knobon and L.A.G. Oerlemans (2006) categorize proximity into three dimensions: geographical proximity, organizational proximity and technological proximity, based on results of previous works. In this paper, we analyze a case study using these three dimensions of proximity. Additionally, proximity can be regarded in terms of general ideas on innovation (e.g. Oerlemans et al., 2001), interorganizational cooperation (e.g. Sternberg, 1999) and regional economic development (e.g. MacKinnon et al., 2002).

Geographical proximity is generally defined as the geographic distance that separates actors (Knobon and Oerlemans, 2006), which leads to shared knowledge and innovation from information exchanges (Torre and Gilly, 2000).

Organizational proximity is defined by similarity in the style and beliefs of actors who are geographically close (Torre and Rallet, 2005). Actors who share the same style and believe that their attributes are similar are more likely to achieve mutual understanding. Organizational proximity can further be regarded as a prerequisite for transfer of implicit knowledge, a joint foundation for determining new resources through collaborative study, and innovation (Burmeister and Colletis-Wahl, 1997; Kirat and Lung, 1999; Knobon and Oerlemans, 2006).

Technological proximity is defined by commonalities in the level of knowledge actors possess about technology (Knobon and Oerlemans, 2006). The term technology itself refers to knowledge that leads to the creation of new products and services using tools, devices, and processes (Tushman and Anderson, 1986). Technological proximity drives the acquisition and development of technical knowledge (Tremblay et al. 2003; Zeller 2004). The concept of technological proximity is important because of its implications in an actor’s capacity to absorb knowledge based on observation. This is based on one’s ability to recognize and take in new external knowledge and apply it for commercial rewards (Cohen and Levinthal, 1990).

These three dimensions of proximity (geographical, organizational, and technological) complement each other. For example, enterprises which share organizational and technological dimensions can compensate a lack of geographical proximity by substituting face-to-face interactions with modern communication technologies (Knobon and Oerlemans, 2006). Additionally, the dimensions of proximity interact with each other with the passing of time. They may strengthen one another at one point in time and weaken each other in the next. Take the actors in Silicon Valley as an example. Though they come from distinct cultural backgrounds, they often have some cultural and normative routines in common (Saxenian, 1991). This results in frequent face-to-face interactions that lead to the development of many different applications of common technologies. In this case, the three dimensions interact with each other. Therefore, Silicon Valley is said to have a climate that promotes collaboration and continual knowledge exchange and innovation (Castells and Hall, 1994).

Moreover, there are case studies of temporary geographical proximity where actors have face-to-face interactions by traveling or changing locations. It is not necessary for actors to have constant encounters when collaborating. Instead, organizational proximity through meetings, brief visits and temporary trips enable collaboration beyond geographic distances (e.g. Gallaud and Torre, 2004, 2005; Hyypiä and Kautonen, 2005; Torre and Rallet, 2005). Geographical proximity is only necessary

for certain processes, such as the acquisition of basic and implicit knowledge, or in the negotiations stage. It is not necessary in the development of knowledge and the business operations stage (Gallaud and Torre, 2004, 2005).

## **2.2 Networks and ties**

Networks are defined as a part of the organization in which individuals are bound together through their relationships. Efficient utilization of human resources is important for continued innovation (Bresnahan and Gambardella, 2004; Crescenzi, 2005; Garnsey and Lawton Smith, 1998; Goman, 2000). Therefore, a knowledge network is regarded as an important element in developing regional economies and increasing the competitiveness of regions (Asheim, Isaksen, Nauwelaers, and Toedting, 2003; Bathelt, Malmberg, and Maskell, 2004; Cooke, Heidenreich, and Braczyk, 2004; Rutten and Boekema, 2007). Human resources are especially limited in peripheral regions, so external knowledge from enterprises and organizations outside the region plays an important role in the development (Chesbrough, 2003; Cooke, Heidenreich, and Braczyk 2004; Brown and Duguid, 2001). It is important to create networks appropriate for importing this valuable external knowledge.

This leads to the question, "What are the most desirable network characteristics for a regional economy?" Knowledge networks are categorized into two types. One is a formal network based on an explicit agreement, such as an alliance between enterprises. Exchanges among the allies' actors occur frequently in this type of network. The other is an informal network with external actors, such as an informal interaction with members of a trade association or union. This network is more dynamic, with partnerships changing constantly (Huggins and Johnston, 2009). In fact, the rate of change is so great that enterprises must update their contacts continuously (Huggins and Johnston, 2009), which can provide a competitive advantage. In the formal network, actors acquire a competitive advantage by accessing the resources of established partners (Huggins and Johnston, 2009). Therefore, much depends on the qualifications of one's partners (Grant and Baden-Fuller, 2004; Ireland, Hitt, and Vaidyanath, 2002; Stuart, 2000). On the other hand, in the informal network, actors can access the latest information directly. The most desirable knowledge network for regional economies alternates constantly, but should be comprised of the most suitable members and partners who can effectively respond to changing needs (Dokko and Rosenkopf, 2003).

It is important to discuss the issue of "Ties," as this element enhances the quality of a network. Ties refer to the relationships between humans and can be categorized into 'Strong Ties' and 'Weak Ties' depending on the strength of relationships (Granovetter, 1978). According to Granovetter (1978), Strong Ties are defined as relationships typically with familiar, close persons and with those with whom a person has frequent contact. Weak Ties are the opposite. Generally, Strong Ties encourage transfers of complicated knowledge, and Weak Ties encourage that of simple knowledge. However, Weak Ties are also believed to provide diverse information (Sorenson, Rivkin, and Fleming, 2006). Knowledge from outside regions is more important than that from inside regions, and it can boost performance (Cooke, 2004). This suggests that regional innovation is based on the interaction of knowledge creation and subsystems linking an enterprise to outside regions. To construct networks that confer competitive advantage on regional areas, it is important to link enterprises, organizations and research institutes with outside regions, and to take advantage of both Strong Ties and Weak Ties appropriately.

Though knowledge networks based on geographical proximity alone are an important factor for the development of regional economies (Malmberg and Maskell, 2006), businesses do not solely acquire the necessary knowledge from inside a region. Enterprises driving innovation flourish by acquiring knowledge from resources beyond national borders (Davenport, 2005). Enterprises that are not able to absorb technologies quickly and efficiently tend to rely on a network inside their region, while others that are more technologically capable tend to have global networks (Drejer and lund Vinding, 2007). Though these actors are not geographically close to each other, the transfer of complicated knowledge is possible through highly effective network structures (Davenport, 2005; Dunning, 2000; Lissoni, 2001; McEvily and Zaheer, 1999; Palazzo, 2005; Teixeira, Santos, and Oliveira Brochado, 2006; Zaheer and Bell, 2005).

Moreover, modern information technologies have enabled the transformation of implicit knowledge

## **2.3 Virtual community and collaborative knowledge network**

The development of ICT and rapid diffusion of the internet in the recent years had changed the meaning of time and space for organizations (Castells, 2000) and allowed them to establish the communities that benefit from networking information advantage, delocalization and fast-paced processes. The concept of "cellular forms" is composed of knowledge workers and designed to avoid the rigidities of bureaucratic hierarchy, and enhance the learning process and development of dynamic

capabilities in order for them to adapt to sudden shifts in the market and new knowledge and technologies (Gloor, Maggio, Passiante, 2006). They function as parts of a virtual community. Virtual community can be defined as a group of people who use ICT as the main means of communication (Cothrel and Williams, 1999) but they also utilize other communication means such as face-to face meetings to support building cohesion and trust in the communities (Storck and Hill, 2000). The most distinctive difference between virtual communities and real communities is that technology is the base of virtual communities, and it enhances the flexibility of the communities to adopt to highly complex business environment (Hildreth *et al.* 1998)

According to Gloor (2006), virtual communities can be systematically categorized into three types of networks; Collaborative Innovation Networks (COINs), Collaborative Interest Networks (CINs), and Collaborative Learning Networks (CLNs).

1) Collaborative Innovation Networks (COINs) are composed of self motivated people with a common vision, and they meet on the web to exchange ideas, knowledge, experiences. They work in a collaborative way to achieve a common goal.

2) Collaborative Interest Networks (CINs) are composed of people with the same interests, but they do not work in a virtual team. Such communities are very frequent on the web. Only a few members are active to share the knowledge and experiences within the community and the rest are silent members who keep information from the web sites, portals, but do not share in the community.

3) Collaborative Learning Networks (CLNs) are composed of people who share knowledge and practice to benefit reciprocally from personal mastery and the collective knowledge accumulation of a group of attitudinally similar people.

These three types of virtual communities from a Collaborative Knowledge Network (CKN) form a high-speed feedback loop. CKNs function with the mechanism that the innovative results of COINs are immediately taken up and tested, refined or rejected, and fed back to the originating COINs (Gloor, 2006). COINs are the creative foundation of CKNs, and with their fundamental principles of “creative collaboration, knowledge sharing and social networking”, they play a role as an enabling factor for the creation of fluid organizations. COINs are generally born around new interesting ideas which were absorbed outside organizations, brought inside and discussed in a collaborative and creative way to improve individual knowledge and capabilities and organizations’ performance.

CKNs link big organizations and exchange information and collaborate with other people over the geographical proximity utilizing ICT. CKN is the key concept to establish a successful network (Gloor *et al.*, 2003).

#### **2.4 Problem of activations in peripheral regions**

Compared to urban areas, peripheral regions fall behind in the leading indicators of knowledge-based enterprises, including innovation and number of patents (Huggins and Izushi, 2007). Knowledge-based enterprises depend highly on intellectual efforts and invest heavily in research and development. On the other hand, small and medium-sized enterprises in peripheral regions have limited resources and depend excessively on knowledge from within their firms. This creates a barrier that discourages innovation and growth (Smallbone, North, and Vickers, 2003). It is, therefore, necessary for them to increase their knowledge networks outside the region (Malecki and Hospers, 2007).

In this paper, we refer to the activities taking place in Matsue City, Shimane Prefecture, where networks of actors are expanding outside this region thanks to the Ruby programming language. In accordance with the suggestions and issues found in previous work, we investigate the elements of desirable networks that add vitality to peripheral regions using of Ruby as a primary reference.

### **3 Regional Industry Promotion with Ruby and Utilization of Network Proximity**

#### **3.1 The case example**

As previously mentioned, peripheral regions lack ready access to potential elements that can support local revitalization, making traditional approaches such as cluster policies, ineffective. The case in point is in Matsue City, Shimane Prefecture, where the Ruby programming language is used to determine the effective elements for peripheral regional industry promotion. There are very few industries existing in this area, so the enterprises there were in a situation in which they needed to find a unique method for regional industry promotion.

Matsue City then initiated a regional industry promotion project relying on the Ruby programming language, a local, homegrown resource developed by someone living in the city. From 2006, when the promotion project started, through the present, it is believed a certain amount of activations of the

project has been maintained. Therefore, we chose this area as the case example to investigate the phenomenon of local revitalization.

### **3.2 Ruby programming language**

Ruby is an object-oriented script language first created in 1993 by Mr. Yukihiro Matsumoto, a man called “Matz” in open source communities, and was released to the public in 1995. Matz lives in Matsue City and has been developing Ruby with many open source developers all over the world through the Internet. In its early stages, although Ruby was popular in the technology community, its applications had not spread into the business world. However, in 2005, David Heinemeier Hansson, a Danish programmer, released Ruby on Rails, a web application framework constructed with Ruby. From then, Ruby began to attract widespread attention from a range of users and was introduced into a number of business areas.

Ruby is an interpreted language, a kind of lightweight script language which does not require compilation prior to running programs. The amount of description is less than that of other programming languages. The grammar is also similar to English, making it easy for programmers to write commands. Additionally, programmers can monitor their programs when running them sequentially. For these reasons, Ruby has received recognition as a highly productive language in the development process for web applications, in which speedy releases and frequent changes are crucial.

### **3.3 Activities of matsue city, shimane prefecture, and the local it industry**

3.3.1. Activities of Matsue City Matsue City, the prefectural capital of Shimane Prefecture, started the project, which attempts to create a new regional brand for the city based on the Ruby programming language, as part of its efforts to regenerate the city and its environs. The project built a physical facility called “Matsue Open Source Lab,” located a one-minute walk away from the Matsue central station. The Lab has become a hub for all activities relating to open source software, transforming Matsue City into a center for open source research, development, and exchanges. Matsue City supports the cultivation of human resources in the IT field with programming training courses in local educational institutions. The city’s main goal is attracting enterprises to the area.

To further support Ruby and advance the project, an organization called “Open Source Society Shimane” was established in 2006 by companies, technicians, researchers, students, and users who specialize in open source software. The group provides a platform for them to exchange knowledge and information, and to improve their technological development skills and project management abilities through utilizing Matsue Open Source Lab. Such activities will enable Matsue City to become a national center for open source software development, which will lead to technological innovation, increased competitiveness in the field of OSS, and above all the development of a modern workforce well versed in the intricacies of the IT world. Ultimately, it will make Matsue City a world-renowned Mecca for Ruby and OSS.

3.3.2. Activities of Shimane Prefecture According to its 2005 commercial report, Shimane Prefecture’s main market for IT enterprises focuses on “Information Service Industries,” amounting to 37% of the total. The proportion of businesses devoted to this market is quite high as compared to all of Japan, at 28.3%. This demonstrates the multiple layers of commission and mutual trust in the relations of similar industries within the Japanese IT field, which exemplifies a typical waterfall model of development.

Following the reduction in investment due to the global recession, Shimane Prefecture needed to decide its own policy course. The prefecture took control of market growth for the IT industry by promoting Ruby, which had received worldwide recognition, and prioritizing the IT industry in 2008. It has invested in cultivating IT human resources, increasing orders for IT system development since 2008. Its aim was to increase the number of employees in the region from 1,092 in 2006 to 1,600 in 2011.

3.3.3. Activities of the Local IT Industry Supporting the activities of Matsue City and Shimane Prefecture, Shimane Information Industry Association, a 40-member economic group of local IT enterprises, started to organize business workshops. Each enterprise also started to develop IT business systems using Ruby as a base. Taking advantage of support measures by Matsue City and Shimane Prefecture, businesses have been expanding their IT market share of Ruby and Open Source Software (OSS) by collaborating to accept orders for large-scale IT systems.

As a results, sales in the IT industry in Shimane Prefecture increased by 57.9% from 2006 to 2010, compared to a negative 3.7% growth rate in the rest of Japan during the same period. Furthermore, the number of employees in Shimane Prefecture increased by 77.8% from 2006 to 2010, while the national average was 12.9% over the same period. Local IT enterprises had already exceeded the target for total employees set by the prefecture in 2009, and the number rose to 1,817 in 2010.

3.3.4. Activities of Other Areas Activities associated with Ruby have been implemented not only in



Shimane Prefecture but also in other areas, including Tokyo and Fukuoka. In Tokyo, Ruby Kaigi is an annual technological conference mainly for Ruby engineers who come from all over Japan and abroad. Large enterprises such as Rakuten, Microsoft, GREE and FUJITSU sponsor the conference. The conference plays a pivotal role in the developmental activities of Ruby in Tokyo.

In Fukuoka, the Fukuoka Ruby Business Hub Promotion Committee was founded in 2008 and plays a central role in related activities in the region. The committee supports Research & Development (R&D) with Ruby and encourages connections with enterprises in Silicon Valley in the United States. In addition to these activities in supporting Ruby in other areas, a network has been expanding outside the regions of Shimane Prefecture and Matsue City.

A Ruby network has been established abroad, and International Ruby Conferences as well as numerous regional conferences are held every year. A representative example is the annual Ruby Conference in the United States, which has been held since 2001, with networks also being constructed in line with the conference. In Europe, the European Ruby conference (EuRuKo) has been held annually since 2004.

Moreover, Ruby Conference China and Ruby Conference in India have also started in recent years, showing the network's expanding influence in Asia.

## 4 Analysis of Network Structure

### 4.1 Methodology for investigation

To investigate how the network changed when activations of these activities occurred, and to verify what activations was from the cross-section of network analysis, we analyzed the structural characteristic of human network by comparison between 2006 and 2011 qualitatively. The questionnaires are, “a) three persons you contact frequently, b) three central persons of the network, you think”, and asked communication media, frequency and contents of the contact with each persons.

### 4.2 Analysis of survey results

Thus, we can make sure the following changes by comparison of network structure between 2006 and 2011.

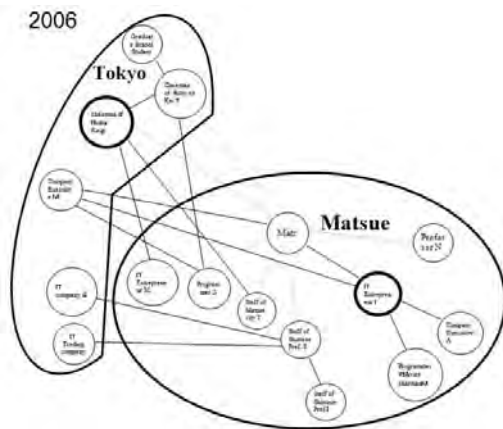


Figure 1 Sociogram 2006

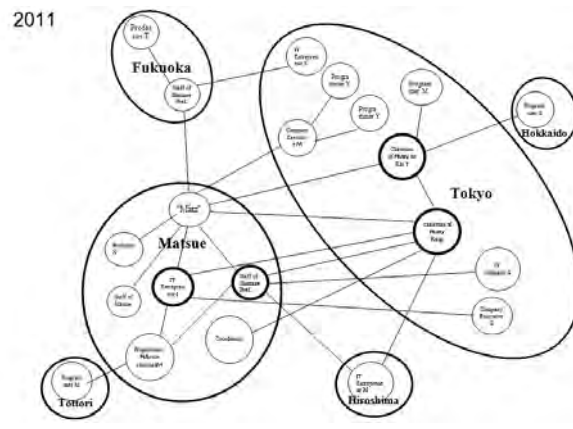


Figure 2 Sociogram 2011

1) Increase of Nodes the numbers of network nodes have slightly increased. This means the expansion of the network on the scale.

2) Increase of Creeks The numbers of n-creeks, groups of nodes that are not complete conjoined relation but neighboring conjoined one another, have increased. To include groups dissimilar in character by the increase of n-node makes network multifactorial. The less dense the region becomes in comparison, the network becomes more balanced.

3) Increase of Hubs the numbers of nodes which play parts of hubs by linking between creeks have increased. By this the communications between hubs not going through the center of network have also increased. This means the decreasing of the centeredness by the communications without Matz. The centeredness is the mark how nodes and edges that consist of network play the center stage within the network. The network structure not depending on unary element has toughness and desirable from the viewpoint of regional economy.

4) Existence of Strong Ties and Weak Ties We define high-frequency contact, once or more a week, as Strong Ties and otherwise Weak Ties. The proportion of Weak Ties has increased from 30% (2006) to 34% (2011). According to the recent researches, it is desirable to redress the balance of between Strong Ties and Weak Ties but the optimum magnitude of it must be examined carefully.

In our questionnaire survey of this time the number of sample is limited, so the result of analysis by the survey is restrictive. At the same time, according to the change of the network structure above-mentioned, we can make sure the expansion of the network which has the rate of information exchange and the multiplicity, by connecting with outside regions which have common technology and knowledge of Ruby, beyond the geographic distances.

## 5 Conclusion

In this research, we investigated the network structure of related actors in a region's business activities and the proximities that provide a foundation for such activities, with the aim of determining the most effective elements of peripheral regional industry promotion.

In the regional promotion project in Matsue City, the number of activations geographically close industries and actors in the area was limited, so they established networks to connect with outside actors who share common technological knowledge of Ruby. Geographically distant actors had face-to-face communications when needed and such temporary geographical proximity compensated for the lack of constant proximity. It is assumed that networks then encouraged communication based on their technological proximity and consolidated their organizational proximity. However, the samples and coverage of this research were limited and the matter will require further research to verify the stated hypothesis. In addition, research issues such as the definition of strength of ties, the desirable balance of strong and weak ties, and further research on web networks should be addressed in future research.

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# The Concept of Architectural Knowledge of the Product\*

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**Abstract:** This paper presents a conceptual model of architectural knowledge of the product (AKP) from a perspective of the knowledge production and diffusion. AKP is defined as the cognitive ability of the organization on learning and applying the technique, skill and experience related the product that embedded into the product architecture design. A systematic expression of AKP was provided which consists of the context, modules and relations among modules. Especially, the context confines the boundary of the product architecture. Issues in the lifecycle of AKP, and strategic value of AKP are discussed, as well as directions future research.

**Keywords:** Product architecture; Architectural knowledge of product; Lifecycle; Strategic value

## 1 Introduction

The product is the main output of enterprise and play media role of value exchange of business. We could observe and analyze the product from the external aspect, i.e., attributes, or from the internal aspect, i.e., product architecture (PA). At present, the form is the dominant way to understand the product architecture (Ulrich, 1995; Baldwin&Clark,2000, Mikkola, 2006), in this paradigm the PA was commonly divided into two types, modular or integral. In fact, the form of architecture is evolutionary switching between modular architecture and integral architecture along with the context of the firm(Shibata et al.,2005; Fixson&Park, 2006; Gu,2012), then if we simplify the PA into either modular type or integral type , the essence of PA can not be grasped, and we have weak measures to improve the quality of PA. In this paper the purpose is to raise a systematic method to understand and grasp the essence of PA, that is, architectural knowledge of the product (AKP). Though AKP was mentioned by several papers (Henderson&Clark,1990; Sanchez,1996; Gu&Peng,2010). However, up to now, we did not get a full picture of the AKP. Then, the purpose of this paper is to establish a picture of AKP and outline related strategic value of AKP.

## 2 The Essence of Product Architecture

The PA is commonly regarded as the form of the composite of modules (Henderson&Clark,1990; Ulrich,1995; Baldwin&Clark,2000). Then, most of the extended researches based on the form-oriented way to explore the value of PA(Baldwin&Clark2000; Takeishi,2001; Mikkola,2006; Sosa,2011; etc.), what the existed research implicated that the modules of PA is homogeneous. What the homogeneous means that though the physical size of module is different, but the strength of relationships among the modules is identical. That is, if there exists a relation (denoted as R) between module A and B, then the strength of R is not varied along with the lifecycle of the product, step more, we can not accurately reflect the learning result of organization embodied in the PA. This case will incur in an organization who owned zero learning ability, but this situation seldom occurs for a rational firm. Therefore, the strength of R is a variable, not a constant. Deeply, the form of PA is a present of PA, the exploration of the essence of PA need a new method.

In order to obtain the goal of understanding the essence of PA, a conceptual model of AKP was established from a perspective of knowledge production and diffusion.

First, the module of PA is a representation of organizational knowledge of the firm which coordinated the total process of product value realization. The design of PA is not a single function of the R&D, but the cooperation and coordination of the whole organization, directly related the manufacturability of assembly department or process. If we consider the postpone strategy, the PA also involves in the delivery and distribution process, and stretch into the service process and the purchasing or outsourcing functions. Then the PA is an integrator of the firm efforts on product design.

Second, in general, the firm owns learning ability that could cope with some technical questions and optimize the knowledge in the total PA, or some modules, or the relationships among modules

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according to the market trend, competing circumstance and technology progress. Then the strength of the relations will change along with the strategic need of PA and the process of value realization of the product from design to service. Then we need think the PA in a value chain perspective, and the knowledge embedded in the PA need a new expression means. Then the AKP is not confined in the PA area, but covers the value chain of the firm.

### 3 Conceptual Model of Architectural Knowledge of the Product

The conceptual expression of AKP constitutes two dimensions: one is located in the PA, the other lies in the value chain of the firm. According to the PA basic feature-decomposition and integration (Ulrich1995;Baldwin&Clark,2000), the AKP conceptual model need provide a structure that the AKP could be measured in two hierarchies, the first is the shared sense of AKP, which reflects one of the stage of the value chain get the cognition to the total PA construction and influences the toughness of coordination along the value chain. The second is the cognition to the modules and interface (where modules also could be named as chunk, element, or component in different literature), which reflects one of the sate of the value chain get the cognition to the constituents of the PA and directly influence the capability of the stage how to proceed the PA and the results of learning and absorption of the PA.

Turn to the component of the PA. What is the component? Though the component (or module, or chunk) was mentioned frequently in the literature, but up to now we can not get the truth of the component, and we can not describe the component definitely. As indicated by Baldwin&Clark(2000), the component is the result of task partitioning and complexity managing, also this is the dominant argument in the modularity related literature. But why and how to partition the task and why will produce the specific components are not self-event. Suppose, there is a task that one person can not deal with it, then he would search for methods to finish the task, by dividing the task into sub-process (Smith,1776) or into components(Simon,1962), as generally named module. Further, how many modules are proper? There are two dimensions could provide the analytic framework. One is the coordination which focuses on the internal perspective that emphasized on the efficiency of task accomplishment; two is the business which focuses on the external environment of the organization (including different types: individual, group, firm, even alliance of firms). Then, the component of PA is not a simple task partitioning, but the balance of management and business of the organization when faced the challenging task. So the existing of components is located into their context: managing capability and business model.

Although Henderson&Clark(1990) and Sanchez(1996) broadly defined the AKP as the knowledge of components and their interactions, if we considering the origin of the component, then we could get the structure of the AKP inferring form the above analysis, that is, the AKP has three basic constituents, i.e., the context of the PA, the interactions among components, and the components themselves. What more important is that the components are not homogeneous, but heterogeneous, which implies that the strength of the relationships of among components will vary along with some principles in the backside, where points out the future directions of the extended research of the AKP.

Now, we get a formal expression of AKP:

$$AKP = F(\text{Context}, \text{Module}, \text{Relations})$$

Where,

The Context is a vector with two dimensions: coordination and business; where defines the boundary of the PA, otherwise we may loss the wholeness of the PA. Though the PA could be regarded as an open system, but if we have not given a definite boundary to the PA, we may get the misunderstanding characteristics of the relations among modules due to various boundaries corresponding to unequal views of the PA entity.

The Module is a vector with multi-dimensions (1, 2, or  $n (n \geq 2)$ ) which determined by the results of recognition of the task partitioning. The module could be scored by the following dimensions singly or combiningly, i.e., the size measured by the person-based or group-based capability load; the interfaces of its boundaries by the technique requirements or coordination needs, or the business strategies; the strategies of encapsulation of the information.

The Relations is a vector with multi-dimensions (1, 2, or  $n (n \geq 2)$ ) which determined by the results of recognition of the strength of the relations. In common, the relations were sorted into tight coupling and loose coupling.

The Function ( $F$ ) is a filter embedded in the organization as argued in Henderson&Clark(1990) and Hendrson(SMJ 1994), with the added analysis oriented to the value chain where the PA moves along

in(Gu,2012). The construction of the function was not confined into the organization, but extended to the environment due to the firm as an open system (Scott, 2003).

AKP is the function of PA where it locates in, its component and the interactions of components. According to the general system theory (von Bertalanffy, 1968: 54-55), the AKP owns constructive characteristics which means “the whole is more than the sum of parts”, and comparing to the modules the PA appear as “emergent”.

#### 4 Lifecycle of Architectural Knowledge of the Product

Now, we could switch the attention of the expression of AKP to its lifecycle. The lifecycle of the AKP is constituted by three stages, that is, the birth, the formulation, and the transformation (Figure1).

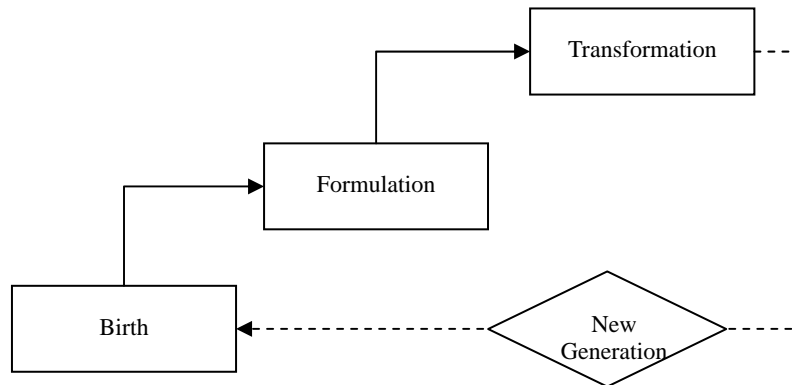


Figure 1 The Lifecycle of the AKP

In the birth stage, the AKP was born by the task partitioning guided by the division of labor, the technique requirements/constraints, and by the business strategies. This a starting point, where could be tracked from multi-sources. The origin of the AKP could from the creativity of the workers, from the learning results by the workers, or even the accumulation of the experience of workers which emerge into a somewhat clear expression of AKP in ones' mind and then was translated into the pragmatic works. There are few understandings of the birth of the AKP, but the naissance of the knowledge of human society provided a good base to explore the origin of AKP. Just as inventions in physical products, the AKP is another form of the presentation of the invention of how to organize the ideal model of the product where combined the experience, the learning, and the accumulation of the artificial intelligence.

When the birth was finished, we enter a process to formulate the AKP which to attain a more formal form of the AKP that could be grasped, understood by the participants. This formulation course may be very short or very long according to the progress of the technology applied in the product, the organizational capability and the attainment of the business goals. As the popular exemplar, the personal computer(PC), in macro level, its PA and AKP evolved in a long period only after vendors provided a professional chip- Central processing unit(CPU) (Intel company, Motorola company, and Texas Instruments company were the pioneers) that provoked the separation of the whole-production style of PC with the assembly style of the PC, where brought a revolution in the PA and AKP of the PC. When retrospect the historic development of the Intel company(Yu,1998), we could get deep understanding of the formulation of the AKP where filled by the techniques challenges, the organizational efforts and the tactics in business strategies.

Along with the progress of the AKP, the transformation is inevitable due to the change of industrial structure, the adaptive response of the firm and the new goal setting-up of the business. Return to the information industry, the software demonstration the transformation of the AKP. For a specific program, there exist many development method guiding the design of the program, for instance, the structural design, the top-bottom design, the object-oriented design, the model-driven design, the architecture-driven design etc., every method provides a new means to cope with the complexity of the software program along with the style evolving of the development organization, from individual-based

to mass collective cooperation-based style.

## 5 Strategic Value

When the PA moves along the value chain, there exist an absorptive relationship between the upstream stage and the downstream. Considering the learning and diffusion process and ability, the absorption effectiveness of the AKP(AEA) determines the opportunities and space of innovations in product design, business design and the optimization of the value chain.

From the product perspective, the operators of modularity (Baldwin&Clark,2000) rely on the AEA, and only when some conditions occurred then on of the operators will take effect. The PA and modularity is not living in a vacuum, but determined by the AEA. Since we mentioned above, the coordination and the business are the two wheels that drive the AEA(Gu,2012).

From the business design perspective, the space of profit exists in the AKP and its constituents, the profit could be produced from whole PA-based, or module-based, or relations-based AKP, then the competence of the business could be reified by the AKP in the product-level. When involved the business strategies, the product is not a sweeping concept, but a detailed presentation with the AKP. If we search for the paths of business model, here open a door.

From the value chain perspective, in general, the calculation of the amount of the products is a key of the economics of the value chain and supply chain. When to optimize the amount of the products, we always assume or neglect that there are zero frictions in the chain conduit. In fact, the frictions can not be eliminated without cost, and the frictions provide a new sight to explore the structure of the chain and will get a new gain of the mechanism of the optimization of the value chain and the evaluation of the PA.

## 6 Conclusion

The architectural knowledge of the product plays key role in the understanding of product architecture. There are three constituents structure the architectural knowledge, that is, the context of coordination and business, the relations among modules and the modules. The AKP is the function of the three constituents which function could be constructed covered the value chain. Especially, the module is the axiom of PA and the starting point of AKP which rooted from the division of the labor and the technique requirements, and determined by the coordination and business. Then the connotation of the module is the fundamental of the AKP conceptual model.

Then, from the perspective of structuralism paradigm, this research deepens the PA from form to structure, and from the perspective of the general system theory, this research defines a systematic approach to analyze the AKP. Correspondingly, to integrate the form, structure and system into AKP is a preliminary step in this conceptual exploration.

For the future directions, we regard the PA and AKP as kinetic entities, it is necessary to conduct research on the dynamics and evolution of AKP.

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## Utilization of Closed Schools for Regional Revitalization

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**Abstract:** Recently in Japan, about 450 schools have been closed annually. More than 30 % of closed schools in Japan are not fully utilized at present. The closed schools should be utilized as the social capital. The necessity of the social business (hereinafter, referred to as “SB”) has increased recently. Based on the research of this paper, in order to make SB plan utilizing closed schools successful, local governments should give the economic support to the SB business operators and also make efforts to promote the closed schools utilization actively. The SB business operators and local governments should cooperate together to promote the closed schools utilization proactively. As one of closed schools utilization contributing regional revitalization, closed schools are required to be utilized for the business resources for the Social Business.

**Key words:** Closed schools; Social capital; Schoolhouse; Regional revitalization

### 1 Introduction

Today, the closed schools utilization is the common social agenda in Europe and Japan. According to the research result of web sites, in Europe, there are some cases that closed schools are utilized as business facilities (such as the diversion to the music business facilities in Germany). However, there are still many closed schools which remain unutilized.

The vital statistics in Japan showed that the population of Japan in 2005 was 127,760,000 and began to decrease. National Institute of Population and Social Security Research estimates the population of Japan will decrease for the future (Figure 1). It means that Japan has become a “declining-population society”. The National Institute also estimates that the population of our country in 2050 will be about 110,600,000 and the ratio of population under 15 years old will be only 11 %.

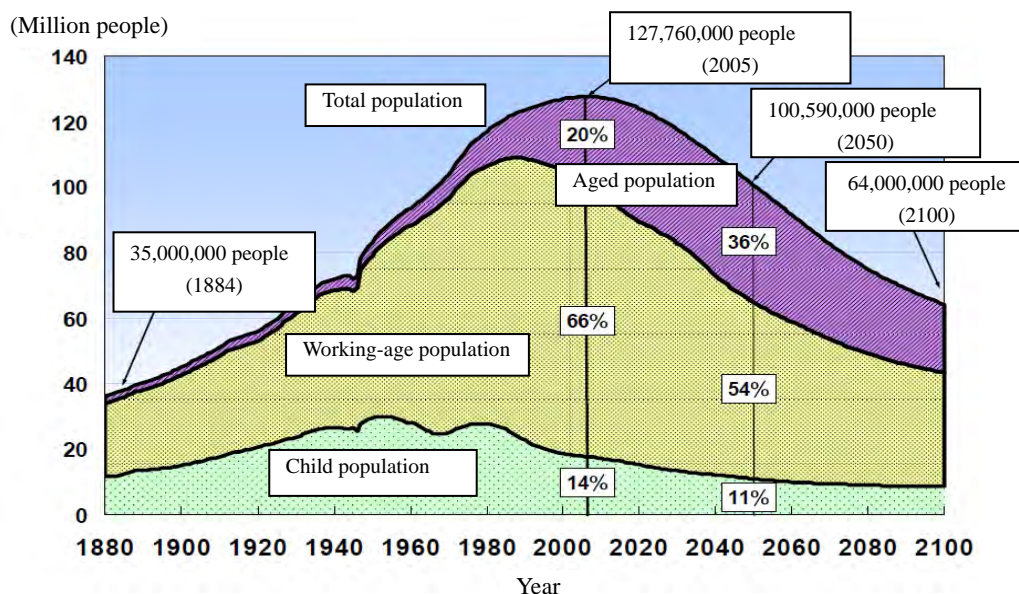
In Japan, the closed schools have recently increased due to the decrease of population. According to the research of the Ministry of Education, Culture, Sports, Science and Technology (MEXT)<sup>[1]</sup>, about 450 public schools had closed annually from 2001 to 2010 (Table 1). Furthermore, it is also estimated that more than 450 schools will be closed annually until 2050.

According to the research of the MEXT, the utilization ratio of closed schools nationwide has remained about 70 % (Table 2). The details of its utilizations are sociophysical training facilities (27.0%), social educational facilities (21.5%), governmental offices and others (7.4%), facilities for changing culture and experience (6.0%), corporate facilities (5.3%), cultural facilities (5.0%), social welfare facilities for the child (4.4%), social welfare facilities for the aged (4.2%), training facilities (3.0%) and so on (Figure 2). As for the utilization of the closed schools, “the public use” cases are quite easy to be converted accounts for the most cases.

Since the legal procedure of the closed-schools utilization was revised by MEXT in June 2008, private use of the closed schools became easier. In September, 2010, the closed-schools utilization was requested by the Board of Audit of Japan<sup>[2]</sup>. The closed schools are required to be utilized widely as the social capital for the regional revitalization.

Recently, the necessity of social business (SB) has been increased in order to solve the social agenda in Japan such as the decline of regional economy, the collapse of local community, and also the environmental problems, etc. According to the definition of the Ministry of Economy, Trade and Industry, SB is the continuous activity that NPOs, local organizations and private institutions, etc solve the social issues by using business method.

In this paper, the case research of SB which promotes regional revitalization by utilizing closed schools is described. Based on the research results, the success requirement of the social business utilizing closed schools are clearly proposed in this essay.



Source: National Institute of Population and Social Security Research (June, 2006)

Figure 1 Dynamic Analysis of Population In Japan

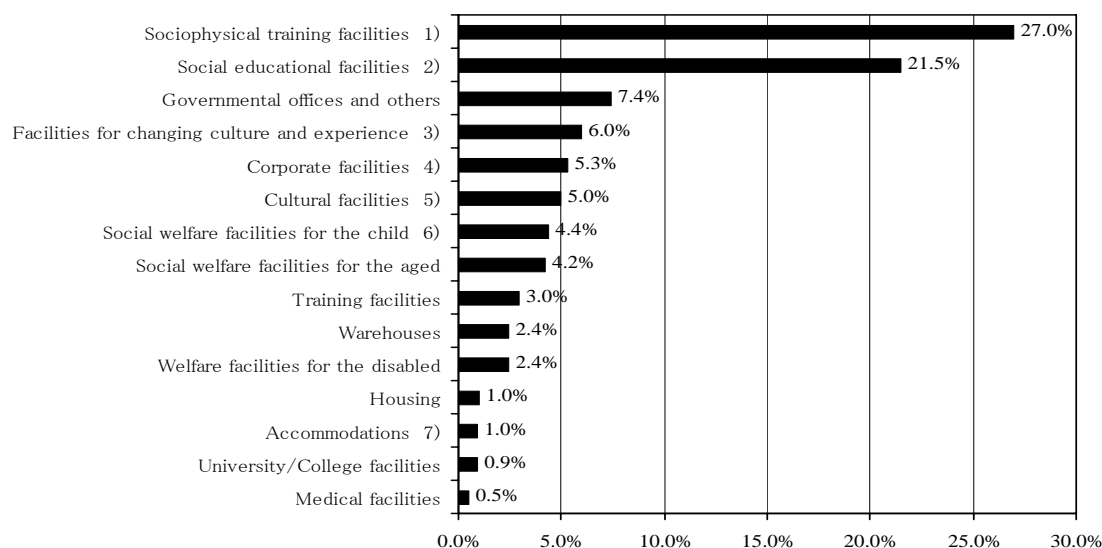
Table 1 Number of Public Closed Schools in Japan (FY 2001-2010)

(Unit: Number of schools)

Schools / FY	2001	2002	2003	2004	2005	2006
Elementary school	221	227	274	374	314	250
Junior high school	64	68	82	117	71	72
Senior high school	26	45	66	86	71	104
Total	311	340	422	577	456	426
Schools / FY	2007	2008	2009	2010	Ratio(2001~2010)	
Elementary school	275	272	333	322	63.7%	
Junior high school	75	87	88	109	18.6%	
Senior high school	114	101	109	73	17.7%	
Total	464	460	530	504	100.0%	

Table 2 Utilization Status of Closed Schools in Japan (FY 2002-2010)

Number of occurrence of closed schools		Utilization status of closed schools		
School division	Numbers	Utilization status	Numbers	Rate (%)
Elementary school	2,641	Buildings not existed (b)	425	10.2 (b)/ (a)
Junior high school	769	Buildings existed (c)	3,754	89.8 (c)/ (a)
Senior high school	712	Utilized (d)	2,620	69.8 (d)/ (c)
Special support school	57	Not utilized (e)	1,134	30.2 (e)/ (c)
Total (a)	4,179	Plan to use (f)	243	6.5 (f)/ (c)
		No plan to use (g)	891	23.7 (g)/ (c)



n=2,620 (multiple answer)

1) Sociophysical training facilities : Sports center, etc. 2) Social educational facilities : Community centers, and lifelong learning centers, etc. 3) Facilities for changing culture and experience : Nature experiencing facilities, Farming experiencing facilities, etc. 4) Corporate facilities : Factory, Office, etc. 5) Cultural facilities : Museum, art gallery, etc. 6) Social welfare facilities for the child : Nursery, students' club after school, etc. 7) Accommodations : Except facilities for changing culture and experience.

**Figure 2 Utilization Status of Closed Schools in Japan (FY 2002-2010)**

## 2 Research Results

In this paper, five research cases of SB utilizing closed schools were conducted. The overview of the research results are shown in Table 3-1 ~ 3-6. The schematic diagram is shown in Figure 3.

1) All the utilized closed schools are public elementary schools (Table 3-1). Elementary schools account for 63.7 % of closed schools occurring in these 10 years as shown in Table 1, therefore, they are easy to be utilized.

2) The contents of business are the operation of commercial facilities, accommodations, and the production facilities of agricultural products & processed animal foods, etc. (Table 1). These businesses have contributed to “Reconstruction of local community”, “Creating of local employments” and “Revitalization of local economy”.

3) In all cases of this paper, closed schools are owned by the local governments, not SB business operators utilizing closed schools. The SB business operators rent the closed school (Case 2, 3, 4, 5) or are consigned the management of them (Case 1) (Table 3-2, Figure 3). The reason why there are quite a lot of tenancy cases is that initial investment can be reduced and also that the local government can take a lead for utilizing closed schools by the tenancy.

4) For the SB business operators utilizing closed schools, there are one case operated by local resident organization (Case 1) and four cases operated by the private institutions (Case 2.3.4.5) (Table 2).

5) For the business promotion type, among the 5 cases, there are two “local leadership” types (Case 1.2) and three “invited-companies” types (Case 3.4.5) (Table 3-2). “Local leadership” type is that local resident organizations and private institutions plan and promote the business by taking the lead. “Invited-companies” type is that the local governments invite the private institutions out of that region. All the “invited-companies” type is operated by the institutions out of that region. In the “invited-companies” type, closed schools were utilized because the status of closed schools is suitable to the condition that the company seeks.

6) The number of employees is from 4 to 35. This means that SB contributes to “the creating of local employments”. The research result shows that there are many employees for the business operation such as production factories (case 4.5) (Table 3).

7) As for the fund raising for initial investment, there are 3 cases which were completely covered

by the subsidies (Case 1.2.4) and 2 cases which were covered by their own funds (Case 3.5) (Table 3-3).

8) For the reduction of rental charge for closed schools, there are 4 cases that reduction of rental charge for closed schools are given from the closed schools owner (the local government and others) (Case 2.3.4.5) (Table 3). As for the reduction of rental charge closed schools, the needs between the local government utilizing closed schools and the SB business operators who wants to reduce the expenses are matched properly.

9) All cases in this paper, the clear management concept and business plan based on the regional condition were established before starting the business. In 4 cases, local governments and the SB business operators utilizing closed schools have cooperated together to achieve this project proactively (Case 1.3.4.5). (Table 4)

10) The common policy of closed schools utilization by the local governments in each case is “the regional revitalization”. (Table 4)

11) As for the local procurement, there are three cases that materials of foodstuff and products were procured locally (Case 1.2.5). As for the local ordering, there is one case that all the repair works was ordered locally (Case 4). And, also there is one case that local procurement and local ordering were not conducted (Case 3) (Table 5). These local procurements and local ordering have contributed to the revitalization of local economy.

12) The business operations except case 3 are favorable. For the Case 3, the countermeasures for the recent decrease of sales could not be taken sufficiently. Therefore, the commercial facilities were closed in case 3 (Table 5).

13) The main merits of closed schools utilization is “Ensuring of business resources”, “Reduction of the initial investment” and others (Figure 3). These merits of closed schools utilization should be announced sufficiently by the local governments.

14) For the future planning, there is the business expansion of closed schools utilized presently and the utilization of the other closed schools at the same area, etc. Therefore, it is expected that closed schools are utilized as the business resources of social business in the future. (Table 6).

**Table 1 Research Results (1)**

Cases	Name of facilities	Name of closed schools	Contents of business
1	The birdhouse of the forest	Tokonabe elementary school	Commercial facilities and accommodations.
2	Akizuno Garten	Kami-akizuno elementary school	Commercial facilities, accommodations, etc.
3	Genki-mura	Fujiminami elementary school	Commercial facilities and plant factory.
4	Senko School Farm Tottori Co., Ltd	Hawai-Nishi elementary school	Plant factory. (The welfare type agriculture business)
5	Shirakami food Co., Ltd	Yamada elementary school	The uncured ham factory.

**Table 2 Research Results (2)**

Cases	The owner of closed schools	Business operators of closed schools utilization	The type of business promotion
1	Tsuno-cho (The local government)	The operational committee of the birdhouse of the forest	“Local leadership” type
2	The Kami-akizu-aikyokai (The management organization of local fortune)	Akizuno Co., Ltd (Agricultural Corporations : The corporation operating agriculture by the corporate form)	“Local leadership” type
3	Saga City (The local government)	Alumis Co., Ltd	“Invited-companies” type
4	Yurihama-cho (The local government)	Senko School Farm Tottori Co., Ltd	“Invited-companies” type
5	Odate City (The local government)	Shirakami food Co., Ltd	“Invited-companies” type

**Table 3 Research Results (3)**

Cases	The number of employees (persons)	Fund raising for the initial investment	Reduction of rental charge for closed schools
1	4	Subsidy	Not reduced
2	10	Subsidy	Reduced
3	9	Own funds	Reduced
4	35 (Disabled persons: 25, Aged persons:10)	Subsidy	Reduced
5	15	Own funds	Reduced

**Table 4 Research Results (4)**

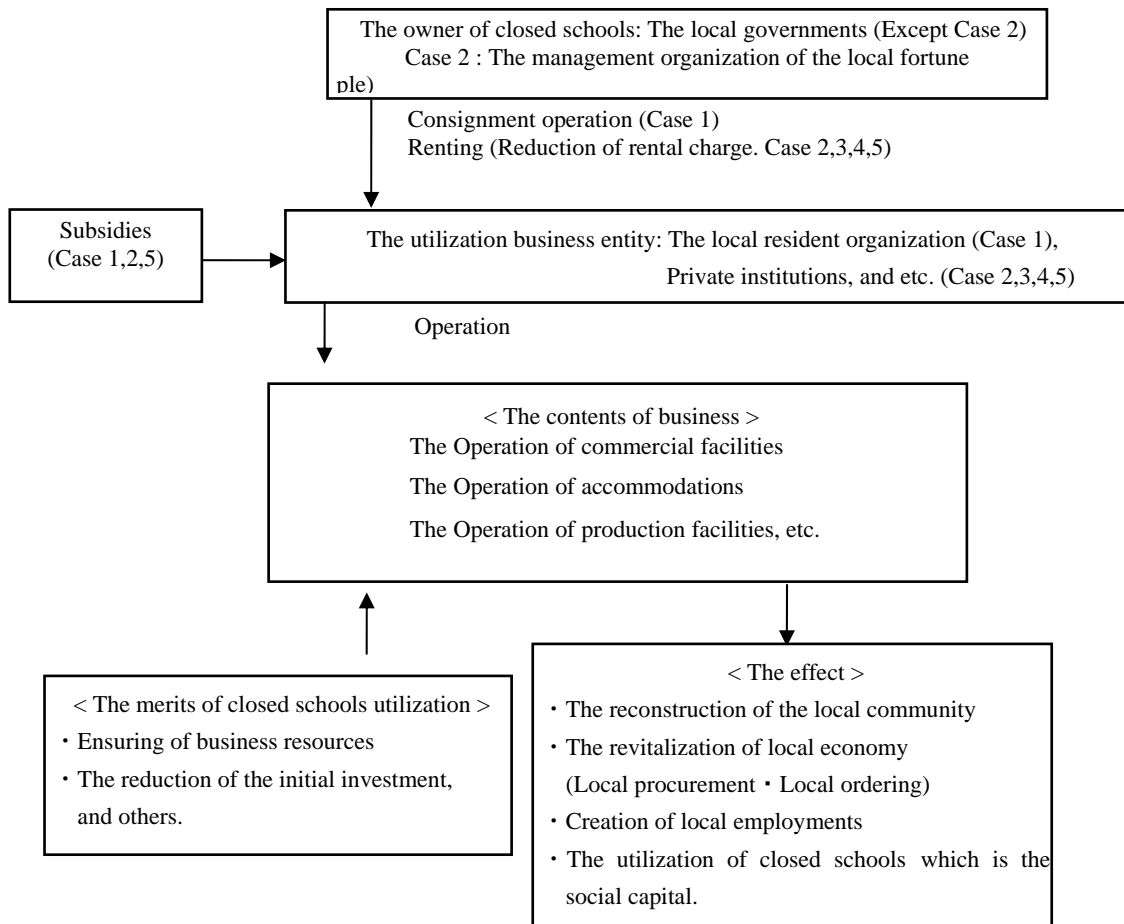
Cases	Process
1	For the first time, the closed school was scheduled to be demolished because there was no application of closed schools utilization. After that, the operating committee of the birdhouse of forest which is the local resident organization applied to Tsuno-cho for the closed schools utilization. Tsuno-cho decided to utilize the closed schools from the standpoint of regional revitalization. The operating committee of the birdhouse of forest was consigned the management of the closed school. This operating committee established the management concept of “Reconstruction of local community”, made the business plan and has started the business since April, 2003. The operating committee and Tsuno-cho have cooperated together in order to achieve this project.
2	The closed school was scheduled to be sold to get enough financing for building a new school. Tanabe City sold the closed schools to the Kamiakizuaikyokai which is the control & management organization of the local fortune due to the regional revitalization. Akizuno Co., Ltd, the agricultural corporation, rented the closed school from the Kamiakizuaikyokai with no charge. Akizuno Co., Ltd established the management concept of “the revitalization of local economy”, made the business plan and has started the business since November, 2008. Akizuno Co., Ltd has promoted this business by the original way.
3	At first, the schoolhouse was scheduled to be demolished because they were too old. After that, Alumis Co., Ltd which is the company located outside of that region applied Saga City for the closed schools utilization. Saga City decided to utilize the closed schools from the standpoint of creating local employments. After getting consensus from the local people, Alumis Co., Ltd rented the closed schools from Saga City by low rental rate. Alumis Co., Ltd established the management concept of “the regional revitalization”, made the business plan and has started the business since December, 2005. Alumis Co., Ltd and Saga City have cooperated together to achieve this project.
4	At first, the schoolhouse were planned to be demolished because it was scheduled to be used for the site of public facilities. After that, Senko School Farm Tottori Co., Ltd which is the company outside of that region applied Yurihama-cho for the utilization of closed schools. Yurihama-cho decided to utilize the closed schools from the standpoint of creating local employments and the revitalization of local economy. After getting consensus from the local people, Senko School Farm Tottori Co., Ltd rented the closed schools from Yurihama-cho by the low rental fee rate. Senko School Farm Tottori Co., Ltd established the management concept, “the welfare type agriculture business”, made the business plan and has started the business since August, 2010. Senko School Farm Tottori Co., Ltd and Yurihama-cho have cooperated together to achieve this project.
5	The policy of closed schools utilization in Odate City was the utilization by the local people. But there was no application of closed schools utilization by the local resident. After that, Shirakami food Co., Ltd which is company outside of that region applied Odate City for the closed schools utilization. Odate City decided to utilize the closed schools from the standpoint of creating local employments and revitalization of local economy. After getting consensus from the local people, Shirakami food Co., Ltd rented the closed schools from Odate City by low rental rate. Shirakami food Co., Ltd established the management concept of “the regional revitalization”, made the business plan and has started the business since January, 2010. Shirakami food Co., Ltd and Odate City have cooperated together to achieve this project.

**Table 5 Research Results (5)**

Cases	Local procurement / Local ordering	Operational status
1	Local procurement of vegetables	Have continued, Favorable condition
2	Local procurement of foodstuff & vegetables	Have continued, Favorable condition
3	Not available	Increase of deficit, The commercial facility was closed.
4	Local ordering of facility repair works	Have continued, Favorable condition
5	Local procurement of pork materials	Have continued, Favorable condition

**Table 6 Research Results (6)**

Cases	Future planning
1	Establishing the nursing care service facilities at the present facilities
2	Newly establishing newly the training business for reconstruction of the local community
3	Conversion of the closed commercial facility to Plant Factory
4	The business development of the welfare type agriculture business to the other area
5	1) The utilization of the other the closed schools in Odate City as the ham factory 2) The move of head office to Odate City. 3) Establishment of the Shirakami ham brand as the special goods in Odate City.



**Figure 3 The Schematic Diagram**

### 3 The Study about the Success Requirement of SB Which Utilize the Closed Schools

Based on the research results, the success requirement of SB utilizing the closed schools was summarized as follows.

Firstly, it is found out that SB business operators who want to utilize closed schools establish the clear management concept depending on the condition of that region, make the business plan and implement the promotion of business. However, there was the case (case 3) that they could not cope with the change of the market environment (the decrease of the sales) and are forced to stop the management of commercial facilities. Therefore, for the continuous business management, SB business operators which want to utilize closed schools should establish a clear management concept, make the business plan and take quick countermeasures depending on the situation. This is especially required for SBs which tend to have less competitiveness and the economic strength.

Secondly, it is also found out that the economic support by the local government (such as the

subsidy for the initial investment of closed schools utilization and reduction of rental charge for closed schools) for the SB business operators have achieved good results for the smooth business management. Therefore, for the smooth business management utilizing closed schools, this economic support for SB business operators by the local government is necessary.

Thirdly, the SB business operators utilize the any closed schools if the condition of closed schools is suitable to the condition that the operators seek. Therefore, the local governments should promote the closed schools utilization, not only in that local area but also in the outside of the local area proactively. As the examples of the promotion of closed schools utilization, closed schools information and the recruitment of the utilization person are found at the web sites of the concerned local government and the Ministry of Education, Culture, Sports, Science and Technology (the closed schools information site<sup>[3]</sup>). And, network building with the local industrial development organization for closed schools utilization are also necessary.

Fourthly, the closed schools are the place for community and also the place for memory. Therefore, about the closed schools utilization, understanding of the local resident should be obtained after enough discussion. Therefore, it is required that the SB business operators and the local governments should build consensus between them. As the examples of this attempt, the questionnaire to the local people and briefing with local peoples are conducted.

Fifthly, it is found out that the SB business operators and the local governments have cooperated together to achieve this project proactively.

Therefore, it is required that SB business operators and local governments should build the cooperative relationship to promote the business operation smoothly,

#### 4 Conclusions

This paper proposes the success requirement of the social business which utilize closed schools.

Main points of the success requirement in this research are summarized as below:

1) For the business continuity management (BCM), it is required that SB operators utilizing closed schools should establish the clear management concept, make the business plan and take quick countermeasures depending on the situation.

2) To promote the closed schools utilization business smoothly, the economic supports by the local government for SB business operators (such as the subsidy for initial investment for closed schools utilization or reduction of rental charge for closed schools) are necessary.

3) Local governments should promote the utilization of closed schools to the business operators not only in that region but also in the outside of that region proactively.

4) With regard to the utilization of closed schools, SB business operators and the local governments should obtain the understanding of local people and also build consensus between them.

5) In order to promote the business smoothly, SB business operators and the local governments should build cooperative relationship.

It is required that the closed schools should be utilized for the business resources of SB as one of the closed schools utilization which contributes to the regional revitalization.

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# Exploring Innovativeness of Small and Medium Enterprises in Sri Lanka

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**Abstract:** Innovativeness has been recognized as one of primary means by which a firm can achieve sustainable growth, as well as address the key issues facing firms in today's competitive environment, greater cost efficiency and the provision of new products to meet customers demand and national economic development. This study aims to explore the factors that drive innovativeness of small and medium enterprises in Sri Lanka. Drawing upon data from 124 firms, the analysis was carried out using correlation and hierarchical linear regression analysis. The findings reveal the fact that besides firm internal factors such as strategic orientation, market orientation and structural flexibility, the external factors such as association with other firms and government assistance programs have positive impact on the firm innovativeness. In addition, high cost of innovation, lack of appropriate sources for finance and lack of information about technology and market are discovered as the obstacles which discourage the innovativeness in small and medium enterprises.

**Key words:** Innovativeness; Obstacles; Small and Medium Enterprises

## 1 Introduction

Small and Medium Enterprises (SMEs) are widely regarded as the engine of economic development due to their significant role in boosting employment and economic growth in both developed and developing countries. One of the vital means through which SMEs are expected to accomplish their goals is by developing and implementing innovations. Firm innovativeness has increasingly become a core focus at the individual, firm, regional, national and global level, across a diverse group of disciplines. Innovativeness is also considered as more important for SMEs than larger counterpart since SMEs operate under the various constraints such as limited resources, poor infrastructure facilities and intense competition, ect. On the other hand, today's business environment characterized with globalization, technological invention, changing customer demand and intensified competition have shorten cycle time of all the value chain activities by pressuring firms to be more creative and efficient in meeting ever rising demands in the market. In recent years, the governments in both developed and developing countries have used various measures to the development of the sector. However, policy makers in the developing countries, in the most cases, often craft regulations to support SMEs with backing of knowledge investigated in the developed countries since such knowledge till is scare in those countries.

Sri Lanka has recognized SMEs as one of prime secretors for promoting the economic growth and development. Given the importance of SMEs to Sri Lankan economy combined with lack of understanding on the factors that contribute to greater firm innovativeness, this study set out to answer the question what factors drive the firm innovativeness? The results of the study will extend our understanding of the significant issues that impact on firm innovativeness and provide valuable knowledge for firm owner managers to make their role better in becoming more competent to meet the needs of dynamic business environment.

However, without proper understanding about how SMEs innovative, what drive them to innovate and what restrict their innovativeness, policy makers and other significant parties could not identify best policies, appropriate assistance and other supportive services to encourage SMEs for the innovation. Therefore, the study further extends its scope to examine obstacles for the firm innovativeness.

The rest of this paper is organized as follows. The second section reviews the literature relates innovativeness in SMEs and presents the research frameworks adopts in the study. The third section presents a brief introduction of methodology used in the study. The forth section is devoted for empirical analysis and the conclusion along with managerial implications are presented with the final section.

## 2 Literature Review

Innovativeness is a broad concept that is regarded in a variety of ways and defined in various means. The terms innovation and innovativeness are often used interchangeably in the literature and yet

there remain significant confusion as to what being referred to. Innovation seems to incorporate the adoption and implementation of “new” defined rather in subjective ways, whereas innovativeness appears to embody some kind of measurement reliant upon an organization’s tendency towards innovation<sup>[1, 2]</sup>. Innovation pertains to the number of successful innovations implemented and innovativeness refers as an organization’s overall capability of introducing new products to the market, or opening up new markets, through combining strategic orientation with innovative behavior and process<sup>[1, 2]</sup>.

One strand of studies has examined firms’ innovativeness in terms of product, process and innovative ways of working<sup>[3, 4]</sup>. Other strand takes into account soft aspects when measuring innovativeness or an innovation orientation. Soft aspects concern with major changes in corporate strategy, management practices, organizational culture and markets.

Recent studies show that the external environment, strategic factors and firm specific characteristics largely affect innovativeness of SMEs<sup>[4, 5]</sup>. Similarly, Keizer et al (2002) divide the factors that drive innovativeness of SMEs into two categories, internal and external, where internal factors refer to the characteristics and policies of SMEs while external factors refer to the opportunities that SMEs can seize from its environment<sup>[6]</sup>.

Owner manager’s commitment to innovation, their actions, strategic commitment to research depending on technological change and their promotion of innovative culture, among the internal factors, strongly determine organizational innovativeness<sup>[7,8]</sup>. Some studies suggest that firm’s absorptive capacity, capabilities, patterns of learning, training, education, growth and performance are related to SME innovativeness<sup>[9, 10]</sup>. Availability of resources, collaboration structures and processes to solve problem are further determined the innovative capacity of the firms. In SME context, financing and skilled workers are more significant. According to the recent literature, absorptive capacity is linked the innovation and indicates that the innovation requires appropriate human capital to raise absorptive capacity of SMEs<sup>[11, 12]</sup>.

In addition to the above mentioned factors internal to the firms, a few studies has considered impact of firm characteristics such as firm age, education of employees and the nature of ownership on firm’s innovativeness. Hausman (2005) shows that younger firms tend more innovative than older firms while human capital is identified as one of the crucial factors in innovation and that absence of necessary skills is a serious impediment to innovation<sup>[13]</sup>.

The most extensively recognized external factors for innovativeness in the literature are collaboration with other firms, linkage with knowledge centers and utilization financial resources<sup>[14, 15, 16]</sup>. Kaminski et al (2008) show that collaboration with suppliers and customers can contribute to innovativeness of SMEs. Customer orientation further impacts on SME innovation since they work closely with their customers on conceptual works<sup>[12]</sup>. Sometimes new ideas may come from the customers themselves<sup>[11]</sup>. Strategic alliances are also shown to be important influencers of innovative efforts when they are integral part of firm’s development plan<sup>[17]</sup>. Networking can lead to positive innovative outcomes since networks create many sources for firms to access new knowledge, skills and information.

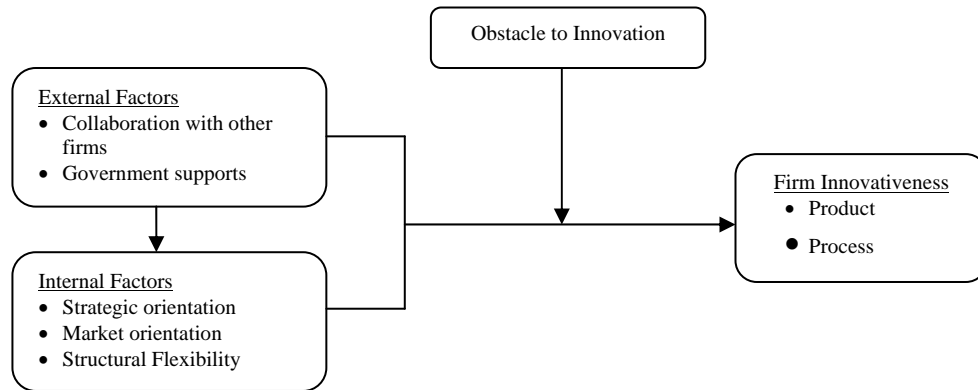
There is rich and well developed literature relates to barriers for innovativeness. Generally, SMEs are expected to have more obstacles and hampering factors for innovativeness than large firm due to inadequate resources, lack of expertise knowledge and other cost disadvantages. Recent literature noted different factors as the barriers for the firm innovativeness<sup>[7, 18, 19]</sup>. Those factors can be divided into two categories, internal and external, where internal factors refers difficulties that are related to resources within the firm including human capital, financial and other firm specific characteristics. External obstacles refers the factors relate to supply and demand forces as well as environment related. Keegan et al (1997) identify high cost associate with innovation, too long pay off period for innovations, lack of government support for business, low availability of venture capital, innovations are too easy to be copied by competitors, high rate of income tax and social influence, small size of the domestic market, national tendency towards job with security, an education system that influences people to get a job are as the common barriers for small firms<sup>[19]</sup>. Similarly, Segarran et al (2008) identified access to technical information, lack of external finance, skilled personal and major customers as the external barriers for the firms while identifying lack of funds and members fearing about risk and cost of innovation as the internal barriers<sup>[20]</sup>. Levy (1993) identified lack of technical and policy infrastructure, the low degree of innovativeness, bad location and inappropriate firm size for the market as the barriers specific to SMEs in less developed countries<sup>[21]</sup>.

The literature reviewed the above point out that there is no agreement among the researchers on

which factors influence innovativeness in SMEs. This situation is common for the system where the behavior of the firms differ by the industry sector and geographical location.

### 3 Research Framework

This study adopts the following conceptual framework (Figure 1), which was developed based on the literature review, to identify the driving forces behind the firm innovativeness and the obstacles which diminish the firm innovativeness. In particular, it examines direct affects of internal and external factors on firm innovativeness and indirect influences through obstacles.



**Figure 1 Conceptual Framework of the Study**

Innovativeness is difficult to operationalize since inconsistencies are prevailed in the definitions used by various scholars. This study operationalizes innovativeness with two dimensions, product innovativeness and process innovativeness<sup>[1]</sup>. Following the literature to date, external driving factors for the innovativeness are operationalized with two categories as innovation subsidiaries from external parties and collaboration with other firms and institutions while internal factors are categorized into three types, firm characteristics, strategic and market orientation and structural flexibility. This study uses cost of innovation, inadequate sources for finance, lack of government support, lack of qualified staff, and lack of information about technology and market are as the obstacles for the firm innovativeness.

### 4 Methodology

The relevant population is defined as all independent manufacturing firms with 5 to 25 employees in accordance with the definition used by Department of Census and Statistics in Sri Lanka. A stratified sampling technique was administered to select the study sample. The sample consists of 124 firms which contain 45 firms from food and beverages industry, 34 firms from textile and rest from the other industries.

The study was carried out by means of a questionnaire survey by directing to the owner managers of selected firms. It is generally believed that, in many SMEs, basic operational functions are carried out by the owner manager and thus the survey was carried out rely on the subjective responses from them. All of main study variables were measured by a set of questions on five point Liket Scale.

Data analysis was done in two stages using SPSS 16 version. In the first stage, reliability analysis in SPSS was administered to assure the reliability. Cronbach  $\alpha$ 's confirmed that each of the constructs is acceptable for the present study. In the second stage, in addition to mean and standard deviation, correlation was performed to examine the relationship between the study variables and investigate the factors that drive the innovativeness. The hierarchical regression analysis was further employed to assess direct and indirect impact of the drivers on innovativeness. In a rather supportive way, ANOVA was employed to identify differences of innovativeness on firms' specific characteristics.

### 5 Results

As can be seen in Table 1, the firm characteristics such as age, education back ground of the owner managers and firm size (number of employees) have no direct and significant impact either on product

innovativeness or process innovativeness. However, business age has a positive impact on firm strategic and market orientations and structural flexibility while education background of the owner-managers has a positive impact only on strategic and market orientations. Firm size has no any impact on three of the above firm internal factors. The literature shows that firm size has a significant positive effect on innovativeness in SMEs. Results of present study not supports the above findings and reveal that firm size has no any impact on product innovativeness or process innovativeness in SMEs.

The external environment plays a significant role in influencing innovativeness in SMEs. The correlation results for the factors used to represent the external environment drivers show that collaboration with other firms and research institutes as well as government support have a significant positive impact on both of product and process innovativeness in SMEs. All the correlations are significant at 0.05 level. These results support the finding of previous studies which have been conducted on both of developed and developing countries.

**Table 1 Results of Correlation**

\* measured on 1-3 scale \*\* measured on 1-5 scale 1 - p - Value

Variable	Mean (SD)	B	C	D	E	F	G	H	I	J
Business Age	8.72 (5.93)	-0.03 0.69	0.42 0.01	0.41 0.36	0.31 0.26	0.34 0.00	0.34 0.54	0.37 0.1	0.33 0.00	0.37 0.03
Education *	1.67 (0.68)		-0.17 0.39	0.13 0.06	0.11 0.12	0.41 0.62	0.08 0.37	0.14 0.00	0.23 0.02	0.27 0.76
Number of Employees	25.91 (10.18)			0.02 0.75	0.10 0.25	0.15 0.09	-0.23 0.46	-0.02 0.53	0.12 0.21	-0.17 0.51
Product Innovativeness**	3.65 (0.43)				0.53 0.00	0.16 0.04	0.13 0.00	0.08 0.03	0.17 0.01	0.12 0.04
Process Innovativeness**	3.95 (0.41)					0.15 0.04	0.17 0.02	0.12 0.00	0.29 0.00	0.41 0.00
Network**	2.41 (0.36)						0.20 0.03	0.34 0.00	0.15 0.04	0.48 0.00
Government Support**	2.35 (0.34)							0.42 0.08	0.01 0.87	0.45 0.36
Strategic Orientation**	3.06 (0.31)								0.23 0.00	0.37 0.00
Market Orientation**	3.68 (0.25)									0.09 0.06
Structural Flexibility**	3.80 (0.35)									

Concerning to the internal factors, correlation results in Table 1 show that strategic orientation has a positive impact on both of product innovativeness ( $r = 0.08$ ,  $p = 0.03$ ) and process innovativeness ( $r = 0.12$ ,  $p = 0.00$ ). The results also confirm that market orientation and structural flexibility are two other significant variables which have a significant positive impact on innovativeness in SMEs. In fact, market orientation is positively correlated with product innovativeness by  $r = 0.17$  and process innovativeness by  $r = 0.12$ . Both relationships are significant at 0.05 level. Similarly, structural flexibility has a positive and significant influence on product innovativeness ( $r = 0.12$ ,  $p = 0.04$ ) and process innovativeness ( $r = 0.41$ ,  $p = 0.00$ ).

In order to identify the obstacles for innovativeness in SMEs, six factors were used in the study. The descriptive statistics calculated on them reveal that factors such as high cost associated with innovation, lack of adequate sources for finance are highlighted as the key hampering factors for the firm innovativeness. Further, lack of support from the government as well as internal factors such as lack of qualified staff and lack of information about technology and market also significantly influence the SMEs in discouraging their innovativeness.

Hierarchical regression was performed to assess the moderating role of the obstacles on relationship between driving factors and innovativeness in SMEs. Firm internal characteristics which were found as the insignificant in driving firm innovativeness were omitted in the analysis. As can be seen in Table 2, the coefficients and corresponding p values appeared in step I confirm the correlation results which collaboration with other firms, government support, strategic orientation, market orientation and structural flexibility have significant impact on innovativeness in SMEs. After entering

the variable obstacles in to the model, results in step 2 imply that obstacles have direct negative impact on the innovativeness as well as it influences to reduce the strength of the coefficients for innovative drivers in second step when compared those of the first step. Moreover,  $R^2$  indicates that the second model has higher ability to predict firm innovativeness with obstacles than the first model which contains only the driving forces. Therefore, the obstacles identified in the study have a negative impact not only the firm innovativeness but it weakens the positive effect of drivers on innovativeness as well. After entering the interaction variable drivers and obstacles in to the model, results of step 3, improving  $R^2$  and deteriorating of F value, clearly show that the role of obstacles which lessen the firm innovativeness .

**Table 2 Results of Regression Analysis**

Variable	Step 1		Step 2		Step 3	
	Coeff.	p	Coeff.	p	Coeff.	p
Collaboration with other firms	0.41	0.02	0.31	0.04	1.23	0.41
Government support	0.53	0.01	0.25	0.00	1.35	0.12
Strategic orientation	0.58	0.00	0.33	0.02	1.44	0.08
Market orientation	0.24	0.04	0.14	0.03	0.56	0.32
Structural flexibility	0.44	0.03	0.08	0.04	1.33	0.04
Obstacles			-1.35	0.00	-0.39	0.02
Drivers *obstacles					8.26	0.00
$R^2$	0.32		0.36		0.42	
F (sig F)	14.5 (0.00)		9.97 (0.00)		8.23 (0.00)	

## 6 Discussion

Examining bi-variate relationships between internal factors as well as external factors and firm innovativeness show that the factors which do not significantly related to innovativeness are firm age, education back ground of owner mangers and firm size. Although some studies have shown that education of the owners and firm's size have a significant impact on firm innovativeness<sup>[3, 10]</sup>. this study shows no evidence to confirm those findings. In line with the findings from the literature<sup>[16]</sup> the results show that collaboration with other firms and organizations has a positive significant impact on product as well as process innovativeness of the firms. However, exiting link they maintain is not well developed and required to develop further for the promoting innovativeness among SMEs. Although existing level of government support is in too minimum when compared with other factors, it makes significant influence in promoting innovativeness of SMEs. Therefore, further government attention is required to pay at promoting innovativeness among SMEs by means of providing subsidies, guidance and other services. Among the internal factors that strategic orientation which reflects firm strategic capabilities, implementation changes over corporate strategy, has a positive impact on product and process innovativeness. These results confirm Salavou et al. (2004) findings which show that strategic choices of owner managers have a positive influence of innovativeness in SMEs<sup>[11]</sup>. A number of studies noted that the significance of market orientation for SMEs to gain competitive advantage in the market which characterized with high competition and global changes. The study results also support the above literature by showing a positive and significant impact of market orientation on firm innovativeness. The key advantages widely noted in the literature relating to innovativeness in SMEs are their internal flexibility and responsiveness to changing circumstances. As par with the literature, the results show that structural flexibility has a positive impact on firm innovativeness. Concern the obstacles, the study confirms the results of previous studies which show that innovation cost and financing and lack of information about technology and markets are key hampering factors in promoting innovativeness in SMEs<sup>[7, 18]</sup>.

## 7 Conclusion

This study attempts to explore innovativeness of SMEs in Sri Lanka. The findings suggest that innovativeness in SMEs is driven by strategic orientation, market orientation and flexible organizational structure as well as factors external to the firms such as collaboration with other firms and organizations and government role in promoting entrepreneurial environment. These results confirm the findings of previous studies which have been conducted in similar settings. However, unlikely developed economies<sup>[6]</sup> the findings show that the education level of owner managers and firm size have no

significant impact on firm innovativeness. Concern to the factors that hamper the innovativeness in SMEs, high innovation cost and inadequate sources for finance are found to be the key obstacles for the firms in way of enhancing their innovative capabilities. These factors are followed by lack of government support and lack of information about technology and market. Since organizational culture plays a significant role in promoting innovativeness, the task for managers is to design and create an organizational culture that stimulates firm competitiveness and innovativeness for ensuring a sustainable growth and development. On the other hand, the existing public policies should be reviewed and modified to create good and better entrepreneurial environment which stimulates the firm competitiveness and innovativeness. The necessary facilities and guidance should be provided to make sound network among the business firms and with research and training institutes. Finally, the empirical evidence of the study could be used nationwide by policy makers to design support programmes and initiatives for promoting innovativeness of SMEs in order to promote sustainable growth and development.

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# Study on the Convergence of Three Southeast Coastal Provinces' Industrial Structure of China

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**Abstract:** According to three related components into Constant Market Share model, namely, market growth effect, composition effect and competitiveness effect, this essay will use a quantitative approach to analyze 30 types manufacturing industries in Zhejiang, Fujian and Guangdong provinces of China from 2003 to 2010, and then study the convergence of manufacturing industrial structure among three provinces. As the research shows, the convergence of manufacturing industrial structure is existed among three southeast coastal provinces of China. Just the convergence between Zhejiang Province and other provinces is not significant in China; even some manufacturing of Zhejiang Province of China might now begin to shift towards other provinces, while there is serious convergence of manufacturing industrial structure between Fujian Province and Guangdong Province of China.

**Key Words:** CMS Model; Industrial Structure; Convergence

## 1 Introduction

Industrial structure refers to the sum of some relations such as the composition of the various industries in regional economic, proportional distribution of the various industries, and the inner links among the various industries. It is such crucial as a key component of economic structure, that it has a very close relationship with economic growth. Convergence of industrial structure means that proportional relationship of the various industries and various departments within the industry in regional economics and the correlation between technology changes and technology diffusion among industries tend to be similar in the process of economic development. It probably causes a large number of repetitive constructions and waste of resource, which is not conducive to economic development. Consequently, there is some theoretical and practical significance through study on the convergence of industrial structure.

In recent years, many Chinese scholars have undertaken extensive researches on the convergence of industrial structure by different analytical methods, such as similarity coefficient of industrial structure, structure deviation degree and deviation factor of employment industries, conversion speed coefficient and direction coefficient of industrial structure, location quotient and so on (Guo Wen-bo, WAN Qing, 2011). Hong Shi-jian (2004) exercised an empirical analysis on the convergence of regional industrial structure in China through employing the indicators such as the Hauffman's coefficient, the similarity coefficient, and the locational quotient. Jiang Jinhe (2005) made an empirical analysis on industrial structure difference and local specialization of high-tech industry in east, middle, west regions and 11 provinces/municipalities in China based on the two indicators: industrial specialization index and industry entropy, and found that high-tech industrial isomorphism is imperfect, and industrial specialization is more obvious from 1995 to 2002. He Canfei, Liu Zuoli, Wang Liang (2008) found out that Chinese provinces were quite similar in their industrial structures by using the similarity coefficient of industrial structure, but industries contributing to the convergence of industrial structure among Chinese provinces differ in different time periods. In summary, there is a considerable controversy about how to identify the convergence of industrial structure among Chinese province in Chinese academia. However, the reason why these disputes exist is that Chinese researchers take different analysis methods.

The author chooses the model of Constant Market Share (CMS model) which was hardly used in the field of industrial structure, and establishes three variables of the model - market growth effect (M), structure deviation effect (N) and competitiveness effect (P) on the basis of previous literatures. And under the help of the model, we can identify whether there is the convergence of manufacturing industrial structure or not among three southeast coastal provinces of China, and finally put forward the corresponding proposals.

## 2 Data Source and Research Method

### 2.1 Research method-CMS model



Constant Market Share Model (CMS Model) was originally proposed by Tyszynski in 1951. Now it has become one of the important models of international competitiveness after being revised and improved repeatedly by Stern, Jepma and Milana. The author adopts the modified extension model in 1986. In general, we should consider the variables of an industry in a certain region as a dynamic process during a certain period, decompose the variation of total industrial output value of a manufacturing industry into three factors which are market growth effect(M), structure deviation effect(N) and competitiveness effect(P) with reference to its region or the country's economic development, analyze their impacts on regional industrial structure quantitatively, evaluate industrial sectors in this region which have relative competitive advantages, and then makes suggestions on the adjustment of the regional industrial structure(Guan Xi,2008).

$$G = M + N + P = \Delta C_i = r C_{ij0} + \sum_{j=1}^n (\gamma_j - r) C_{ij0} + \sum_{j=1}^n (C_{ijt} - C_{ij0} - r_j C_{ij0}) \quad (1)$$

In the equation,G is the total growth volume of all manufacturing industries' gross output value during the t time in i research area, namely  $\Delta C_i$ .  $C_{it}$  is the gross output value of all manufacturing industries in t time period in i research area,  $C_{jt}$  is the gross output value of j industry in t time period in i research area,  $\gamma_j$  is the ratio of the growth output value of j industry in t time period in three research areas,  $r$  is the ratio of the growth output value of all manufacturing industries in t time period in three research areas.

Expressed by  $rC_{ij0}$ , M refers to the regional market growth volume of output value of j industry in t time period in i research area. It indicates the growth volume of gross output value of j industry in t time period in i research area in accordance with the regional average ratio of the growth.

Expressed by  $\sum_{j=1}^n (\gamma_j - r)C_{ij0}$ , N refers to the regional structure deviation effect index, and is used to analyze the deviation of gross output value of the j industry in i research area from the same j industry in the whole region. The size of  $C_{ij0}$  can show the importance of different industries in i research area. The bigger  $C_{ij0}$  means that j industry plays a more significant role on manufacturing market of i area. And the comparison of  $\gamma_j$  and  $r$  reflects the characteristics of different manufacturing industries development in i area. The relative economic growth level  $\gamma_j$  is bigger than  $r$ , which indicates that the growth rate of j industry in i area is faster than that of the reference industry in reference area. Bigger the structure deviation index is, the greater impact j industry has on i area.

Expressed by  $\sum_{j=1}^n (C_{ijt} - C_{ij0} - \gamma_j C_{ij0})$ , P refers to the regional competitive index, and is used to analyze the relative competitiveness of the j industry in i research area. As known to this formula:  $C_{ijt} - C_{ij0} - \eta C_{ij0} = C_{ij0}(\eta_{fact} - \eta)$ ,  $\eta_{fact}$  is the actual ratio of the growth output value of j industry in t time period in three research areas, so competitiveness effect is actually the comparative result of  $\eta_{fact}$  and  $\eta$ , which can judge the relative competitiveness of the j industry in i research area. The greater variable indicates that this industry has the greater contribution to the output value increment of all manufacturing in i area.

Because market growth effect index does not involve the comparison of the parameters of the j industry in i research area, thus, the author focuses on the research of structure deviation effect and competitiveness effect during the research of the regional industrial structure. And structure deviation effect and competitiveness effect reflect the foundation and the speed of development separately. According to the calculation N and P, this author analyzes their combination, and then makes conclusions of table 1(Sun Hui, Ou Na,2011).

**Table 1 Industrial Classification**

N	P	Industry Classification	Characteristics
(0,+∞)	(0,+∞)	Competitive Industry	The basis is good, and the speed is fast.
(-∞,0)	(0,+∞)	Potential Industry	The basis is poor, but the speed is fast.
(0,+∞)	(-∞,0)	Weak Industry	The basis is poor, and the speed is slow.
(-∞,0)	(-∞,0)	Mature Industry	The basis is good, but the speed is slow.

**2.2 Data source**

According to the statistical yearbook of China, manufacturing is composed of 30 industries,

including non-staple food processing; food manufacturing; beverage manufacturing; tobacco processing; textile industry; garments, shoes and hats manufacturing; leather, furs, down and related products; timber processing, bamboo, cane palm fiber and straw products; furniture manufacturing; papermaking and paper products; printing and record medium reproduction; cultural, educational and sports goods; petroleum processing, cooking and nuclear fuel processing; raw chemical materials and chemical products; medical and Pharmaceutical Products; chemical fiber; rubber products; plastic products; nonmetal mineral products; smelting and pressing of ferrous metals; smelting and pressing of nonferrous metals; metal products; ordinary machinery; for special purpose equipment manufacturing; transportation equipment; electric equipment and machinery; telecommunications equipment, computer and other electronic equipment manufacturing; Instruments, meters, cultural and office machinery; handicraft article and other manufacturing industry; recovery of resource discarded and useless material. In order to make it easy to reference them, the 30 industries are marked as industry 1, industry 2... industry 30 correspondingly. Allowing for the availability of data into account, the author can have reference on Zhejiang, Fujian and Guangdong statistical yearbook of China from 2004 to 2011, select the data every 2 years as current observations to calculate and compare, and improve the feasibility of CMS model.

### 3 Results and Analysis

Based on the above formula, the industrial structure deviation effect index and competitiveness index are measured by the CMS model analyzing the industrial structure of Zhejiang Province, Fujian Province and Guangdong Province of China from 2003 to 2010, and then obtain their industry classification respectively, which are described in the following figure 1, 2, 3.

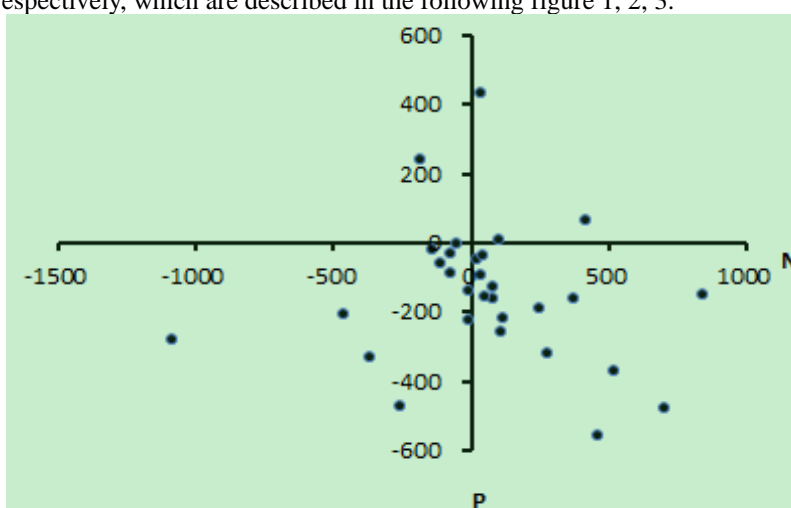


Figure 1 Industrial Classification of Manufacturing in Zhejiang Province of China

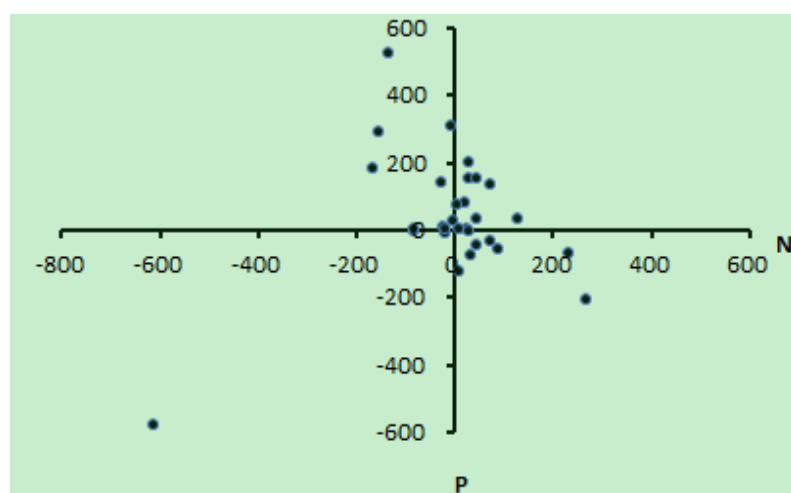
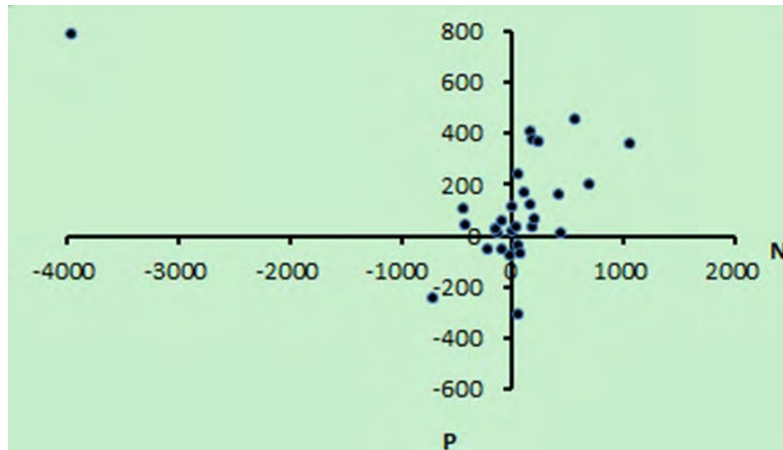


Figure 2 Industrial Classification of Manufacturing in Fujian Province of China



**Figure 3 Industrial Classification of Manufacturing in Guangdong Province of China**

Through the analysis of the calculation results, it can be seen firstly that industry 9 and industry 20 are the common competitive industries of Zhejiang Province and Guangdong Province of China, industry 1, industry 3 and industry 7 are their common mature industries, industry 2 and industry 8 are their common weak industry, but their potential industries are totally different. Thus it is clear that there is some convergence of manufacturing industrial structure in Zhejiang Province and Guangdong Province of China, but not significant. Secondly, there is no common mature industry in Zhejiang Province and Fujian Province of China, but the unique potential industry of Zhejiang Province of China is one of 9 potential industries of Fujian Province of China; industry 7, industry 11 and industry 27 are their common mature industries; industry 18, industry 24, industry 25, industry 26 and industry 29 are their common weak industries. Therefore, the manufacturing industrial structure convergence in Zhejiang Province and Fujian Province of China is significant. In the end, the competitive industry and potential industry of Fujian Province of China coincide with those of Guangdong Province of China highly. For example, 8 of 10 competitive industries of Fujian Province overlap those of Guangdong Province totally, and 6 of 9 potential industries of Fujian account for 3/4 of those of Guangdong Province. So there is serious industrial structure convergence between Fujian Province and Guangdong Province of China.

In the second place, there are 10 competitive industries and 9 potential industries in Fujian Province of China, and 15 competitive industries and 8 potential industries in Guangdong Province of China, which indicating that most of the manufacturing in Fujian Province and Guangdong Province of China has maintained this rapid development trend from 2003 to 2010. Comparing with the two provinces, it is obvious that the development of the manufacturing of Guangdong Province is more prominent, and the industrial structure is more perfect.

#### 4 Conclusions and Suggestions

In brief, the convergence of manufacturing industrial structure is existed among Zhejiang Province, Fujian Province and Guangdong Province of China, but Zhejiang Province has gradually lost its advantages in 30 manufacturing industries, which is catching up by Fujian Province and Guangdong Province. Compared to other provinces, there are just 3 competitive industries in Zhejiang Province of China, including Furniture Manufacturing, Raw Chemical Materials and Chemical Products and Smelting and Pressing of Ferrous Metals. Thereinto, only Raw Chemical Materials and Chemical Products is its unique competitiveness, only Instruments, Meters, Cultural and Office Machinery can be seen as its potential industries, the growth rate of 12 industries is slower than the average level of the same industry in the region, and the mature and potential industries of Zhejiang Province of China is gradually becoming the potential or competitive industries of other provinces of China. Consequently, industrial transfer is taking place from Zhejiang Province to Fujian Province, Guangdong Province in China. Besides, there is fierce competition between Guangdong Province and Fujian Province. The two provinces are seizing resources and markets in the race. If there is no limit to develop, vicious competition may occur, and is not conducive to economic development.

Therefore, the first suggestion to three provinces of China is to set up the regulation of market which integrates with the global market, unify market admittance and withdrawal mechanism, and

achieve the opening up; Secondly, the government should eliminate information blockade, emphasize information publication, strengthen information sharing, reduce social costs, improve the comprehensive competitiveness of the whole region; Finally, district government of China should take the capacity of the whole market and local actual factor endowment into consideration, strengthen coordination and division, achieve the overall regional welfare maximization, and avoid a new round of repeated investment and construction.

Because of the application range of CMS model that is rarely used in the field of industrial structure, and the limitations of the theoretical reserves of the author, as well as lack of corresponding material, there are some shortcomings on some issues although research design and guiding ideology are very clear. Therefore, deeper research and improvement is necessary in the future.

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# Innovation, Integration and Improvement of Clothing Industry

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**Abstract:** With the international industry transfer and the development of domestic economy, the clothing industry, which experienced 30 years of rapid growth, has become an important part of people's livelihood and export industry. Like other traditional industries and some modern industries, clothing industry enjoys an unprecedented scale, but it is still in the old pattern of extensive operation, in terms of resource allocation, production mode, organization management and industry research. This thesis attempts to establish a new clothing industry concept in accordance with the consumption demand by breaking through the trade division within the product economy mode. Through the growth model analysis, it is pointed out that the development of clothing industry relies on product innovation and design innovation. Based on economic scale, the scope economy theory and management practice, the research method of segmentation and integration can be used to put forward strategy of industry development through the implementation of brand, and can also realize the professional integration of products and services for industry resources from both inside and outside. At last, this thesis gives some suggestions from aspects of manufacturer brand, retailer brands and designer brand management based on values, basic variable, target market definition brand categories.

**Key words:** Technology Innovation; Resources Integration; Industry transformation

## 1 Introduction

### 1.1 Clothing industry

Industry division of clothing industry, Shoes and hats industry and adorn articles industry resulting from long term plan economic environment not only impede the development of clothing branding, but also cause so much resource waste and overlapping investment, which is bad for the transverse and longitudinal integration of industry resource. The aim of consumption production is to meet the production and service need of customers. Clothing productions are including of clothing, hats and shoes, and clothing service includes of clothing aesthetic, pop and style collocation. Single product operation can't satisfy consumer demand, and it also against industry resources integration and the brand development.

Clothing consumption and clothing industry is an integration which provides all kinds of clothing products and service. Clothing service can be shown by brands, including of pop released, style collocation and a series of product, such as jewelry, handbags and cosmetics. The conception of industry improvement model, branding strategy and industry integration in thesis is based on the clothing production conception, which is different with the traditional production and industry conception.

### 1.2 Innovation device of industry growth

Industry improvement rests with price and amount. Amount depends on the market need, and price depends on value, so the industry study should be based on the need and value. We can see that the need is depends on product types and market capacity from the analyses of industry improvement model, so we should not only create new markets through the product innovation to develop new products, but also improve the product functional, reliability, convenience, difference and uniqueness to improve the value of the products. At last, we can get the conclusion that there is much market spacer for design innovation, product innovation can create the new market and industry growth depends on technology drive such as product innovation and design innovation.

### 1.3 Management device of industry growth

#### 1.3.1 Resource integration

There are scale economic and scope economic in clothing industry. Resource specialization and integration in clothing industry can help get scale economic benefit. Resource integration among different industries can help obtain the scope economy effect.

#### 1.3.2 Brand strategy

Brand is the system performance of the industry resources integration, industry in different departments can realize branding development through the resource integration. But since different department resource advantages and competitiveness is different, so choosing different market positioning and the development direction is the brand the foundation of success.

## 2 Industry Technology Innovation

### 2.1 Industry environment

There are many influence factors of outside environment in industry improvement. According to the analysis of clothing industry factors on PEST model, we can learn that the interaction between the pluralism and globalization is driving industry improvement from the design, production and marketing of the profound changes. The most important environment factors are economics, society culture, technology and politics.<sup>[1]</sup>

#### 2.1.1 Intensifying competition of domestic market

With the economic globalization, potential competitors in the domestic market (international brands in China, export enterprises turned to domestic) and alternative goods (imported ready-to-wear)

#### 2.1.2 Instability of international market

Financial crisis and economic recession has led to reduced consumer demands; processing industry has transferred to countries with lower labor costs; exchange rates and export policies are with much uncertainty; trade protectionism ( the employment pressure and trade deficit ) has arisen; cultures and lifestyles have been existing differences ( ideology and international influences ).

#### 2.1.3 Extensive operation of the industry

The long-term segmentation among branches and markets has caused the unshared resources. Export enterprises have entered the international industrial chain while domestic-focused enterprises have been marketing one's own products with vague boundary (big and complete, small and complete), primitive organization (family business), backward operation and management (experience-oriented), and unstable supply; repeated constructions; homogeneous goods in the market; and intensified price competition.

#### 2.1.4 Industry's on-going evolvement

For managers, the main challenge is how to identify what is real opportunity and what is fleeting apparition things in the industry evolution process. On the basis of fully understanding the evolution of specific industry, managers usually make the problem become easy to solve once they established strategies.<sup>[2]</sup> By the framework by Anita mecca of industry evolution research for grace, we can divided clothes industry development track into three phases, cottage industry and machinery industry.

### 2.2 Industry growth models

To begin with, a basic fact should be confirmed: industry growth is contributed by the quantity and price, and quantity is decided by demand, price and value, therefore, industry development research is focused on the two basic variables---demand and value. The point is, magnitude of value is the foundation of price, but supply and demand equilibrium or non-rational factors can also affect the price. In different stages of the industry's life cycle<sup>[1]</sup>, the rise and fall is influenced by the value, but not fully represents the ups and downs of the value. From further analysis, we can identify the driving variables of demand and value. In other words, the demand is produced by product types and the corresponding market space, while value is produced by the functionality, reliability, convenience, diversity and uniqueness of product.

**Table 1 Analysis Chart of Variables in Industry Growth**

Industry Growth	Value		Driving Forces	Market Changes	Environmental Factors	
Demand	Basic products (primary demand)	Function	Protection & aesthetics	Marketing Innovation (Radical mode)	New mode	Level of economy
		Reliability	Textile & Pattern			
		Convenience	Cleaning & storage			
	Trendy products (fashion demand)	Function	Protection & aesthetics	Design Innovation (Progressive mode)	New space	Popular culture & Aesthetic preferences
		Reliability	Textile & Pattern			
		Convenience	Cleaning & storage			
	Diversity	Fashion & style				

Personalized Products (self- realization)	Function	Protection & aesthetics	Product Innovation (Burst mode)	New market	Pursue of Value & Aesthetic preferences
	Reliability	Textile & Pattern			
	Convenience	Cleaning & storage			
	Uniqueness	Ego & Innovation			
Innovative Products (Potential needs)	Function	Protection & aesthetics	Product Innovation (Burst mode)	New market	Science and Technology Progress & Lifestyle
	Reliability	Textile & Pattern			
	...	...			

mainly driven by product innovation and design innovation. In addition, the growth of industry's key point should also be the changes and influence of business model brought by marketing innovation, although the change and influence do not create new growth markets<sup>1)</sup>, they will restructure competition pattern of industry, resulting in the change of competitive position of enterprises.

2.2.1 Product innovation

Product is the basic material supplied by the industry to the market, so we are unable to carry on the exchange without products, let alone industry. Product innovation is the potential consumption demand brought by the development of science and technology and the new lifestyles.

Science and Technology →New Materials & New Environment →Innovative Products(New Fabric and Functional Clothing)→Basic Products

Lifestyle →New Content & New Space →Innovative Products →Trendy Products →Basic Products →Trendy Products

Driving forces for product innovation are the progress of science, technology and lifestyle changes, because on one hand, the progress of science and technology will expand the people's production and scope of life, leading to the new needs of clothing, such as aerospace technology development hastened the birth of spacesuit; on the other hand, technical progress has brought new functional fabrics and new functional products, such as chemical defense suit, radiation proof clothes, and other functional clothing. The development of flame retardant fiber has produced new combat uniforms. And the lifestyle change has brought new life content and life space, and it will inevitably lead to product innovation and the rise of new markets; the rise of sports and leisure life has led to a series of product development of sports products and leisure products. Jeans from the United States is an epoch-making product innovation.

2.2.2 Design innovation

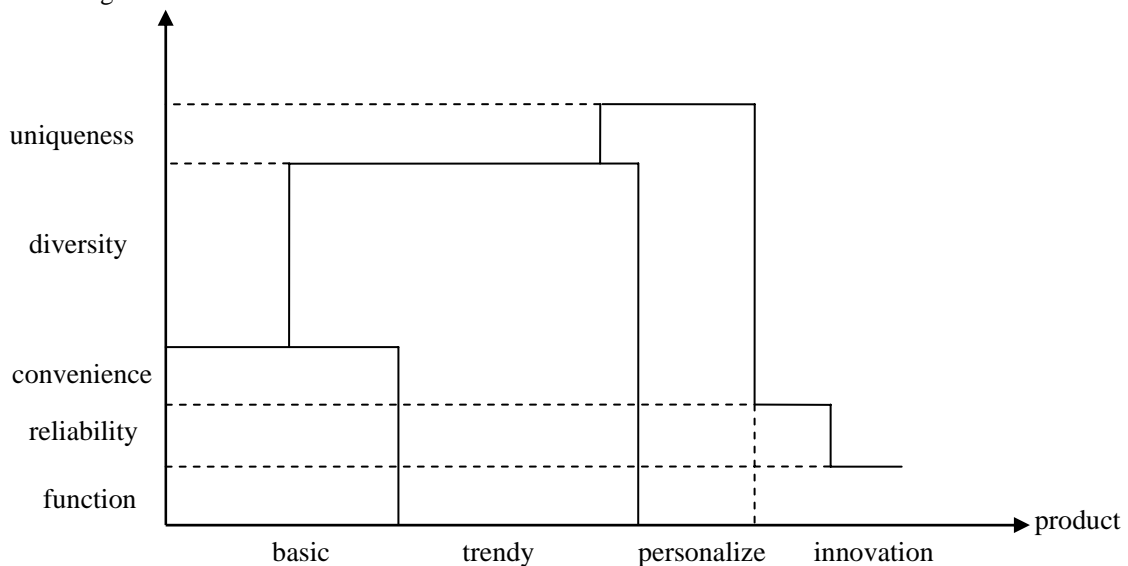


Figure 1 Product and Design Innovation

Design innovation is the improvement and upgrade of given products, so as to promote the progressive development of industry. Design innovation is to continuously meet the consumers' increasing demand. Although there are burst of innovative products like jeans, the long-term industrial development will be mainly focused on progressive innovation. With the help of Hierarchy Mode of Needs by Maslow, innovation gradient of clothing products can be arranged. (see figure 1)

**Functional innovation** mainly targets at products' reliability and convenience. After the rise a brand-new product, the reliability and convenience of use should be improved firstly. Clothing products mainly depend on the continuous improvement and technology of auxiliary fabrics' function, which needs the involvement of upstream supplier and technological breakthroughs, such as warmth, ventilation and cleaning technology.

**Service innovation** is based on social demand of consumers within the aesthetic preference and pop culture. It goes well with the trend of the time, in order to meet consumers' demand for the social attribution. The key to clothing product service innovation is the understanding and performance of cultural tradition and fashion trends.

**Distinctive innovation** is based on the consumers' personalized demand for self-realization and the purpose is to highlight the extraordinariness. After the function and reliability have become perfect, how to directly relate a product to special work of an individual consumer (couture)<sup>[3]</sup> will be a problem. Diversified demand for clothing has brought a broad space for personalized innovation of products and the development of couture industry.

### 2.2.3 Industry innovation growth

Given that demands come from products and market space, we should continuously create new products and then new demands. This is a design process from nothing to being, so called products innovation. At the same time, upgrade function, reliability, convenience, and diversity<sup>[3]</sup> of the existing products, in order to increase their value. This is different from creating new products, but to reform products innovatively, or, design innovation. To conclude, the industry growth is driven by products innovation and design innovation. In addition, the industry growth should also pay attention to the influence of business modes' changes caused by marketing innovation. Those changes do not create new growing markets directly<sup>[3]</sup> but they will lead to the integration of competition within the industry.

## 3 Resource Integration of Industry

The production and marketing of clothing contain scale economy and scope economy<sup>[4]</sup>. Implementation of resource specialization and integration within the industry, the cross-border integration of resources are conducive to giving play to the scale economics and scope economics effect.

### 3.1 Integration of scale

In the clothing industry, there are internal economy of scale and the external economy of scale, namely the factories and enterprises' scale economics and industrial scale economy<sup>[5]</sup>.

#### 3.1.1 Specialized Integration

Under the double pressure of financial crisis and the rising cost of labor, small and medium sized processing enterprises, especially the export enterprises have been in a difficult situation. Timely internal specialized integration is beneficial to the optimization of the industrial structure and reducing the idle resources. Specialized integration, for one thing, strengthens technology and divides labor through merger and reorganization among similar companies or enterprises, so as to improve labor productivity, to reduce energy consumption, to reduce production costs, thereby enhancing the internal scale economics effect; for another, specialized integration leads the development of industrial aggregation, accelerates technological innovation, improves management, enhances infrastructure and professional services, so as to promote the scale economics effect. At the same time, two questions need to be considered: first one is the restriction from production factors and market environment; the second is the risk brought by industrial decline and transfer.

#### 3.1.2 Overall Integration

With 30 years' reform and opening up, the export processing enterprises, which have been fully integrated into international industrial chain, possess higher level of quality control and cost management. However, domestic-focused enterprises are still operated in the "Sell what you make" mode with backward extensive production operation and management. The long-term segmentation among branches and home & abroad markets have led to the difficulties to share resources. Breaking departmental boundaries, setting up brand-driven enterprises and a new industrial chain combining export and domestic markets will not only give full play to the production advantages of export



enterprises, but also conduce to the promotion and development of local brands' competitiveness.

### 3.2 Integration of scope

Clothing products and services have a variety of types. Consequently, costs in such fields as human resources, marketing channels, advertising, sales promotion and others will surely occur, which lays the foundation for the economies of scope.

#### 3.2.1 Integration of products

According to different levels of consumption, the clothing goods can be divided into basic products, matching products and additional products. Clothing is the leading products with shoes, bags as matching products and jewelry, watches, cosmetics and others as additional products. These products have a very strong complement for their similar market positioning, style and consumer groups. Complementary products can produce significant economies of scope in the design, R&D, marketing channels and brand promotion. Many internationally well-known fashion brands are trying to produce their own bags, leather goods, cosmetics and other products lines, such as Dior (C.D) from France and Armani from Italy.

#### 3.2.2 Integration of service

Service industry is becoming the core of industrial value chain. In order to obtain more abundant and economic resource, cross-over design is also gaining more and more attention of fashion industry. Different categories of art provide the foundation for economy of scope. Aesthetic accomplishment, expression techniques, creative inspiration of artists and designers are highly communicative and interconnected. Cross-over design possesses not only the common aesthetic basis but also the economic performance of learning from each other among different art categories. Cross-over marketing is also based on the resource integration of scope economy, but actually, this kind of marketing combination has appeared for a long time, such as sales of souvenir in museums and sales of sporting goods in golf clubs.

### 3.3 Branding strategy

With the continuous improvement of technology, the reliability of production has become a , and fashion and creativity are replacing physical index, becoming the focus of competition. The purpose of enterprises is changing from "what change can we make" to "what can be thought out" and "how to make cognition be easy to understand". In other words, the dominance of the market is shifting from production to design innovation and marketing services.

#### 3.3.1 Brand positioning

Branding is a systematical demonstration of industry's resource integration, and different departments in the industry can realize brand development through integration. But with resource advantages and competitiveness of different branches, the choice of different market positioning and development directions certainly is the foundation for a successful brand.

**Values:** Every enterprise has its own value inter zone, and no brand can cover all the aspects. Because both enterprise resources and social resources are limited, the enterprise must allocate weights on the resources in accordance with their own values. Consumers' preferences and needs vary from each other, therefore, the salient features instead of all aspects of brands should be highlighted, and the simplistic pursuit of perfection will cause high cost and consumers' over satisfaction. Therefore, for no matter the manufacturers, the retailers or designer brands, the key to outstand in competition is the correct selection of target consumer group, maintaining the match between resource ability and consumers' demand, and in one word: serving target customers who share the same values with the brand.

**Basic Variables:** All the consumers have motivation and desire for basic needs, trendy needs and self-realization, but preference and consumption capacity are different. The choice of target market has a lot of detailed variables, and each brand have their own unique choosing dimension. The more specific market classification is, the more important details are, which has been incisively discussed in many marketing theories. People still select the basic variables from the perspective of industry. Compared with the psychological variables and behavior variables of social context, geographic and demographic variables in natural context are more stable<sup>[6]</sup>; gender and age of consumers are among the basic variables. Gender, obviously, does not need to be divided by standards; but age has different interval division, which is directly related to psychological variables and behavioral variables.

**Target Market:** Suppose that the age is taken as a basic variable in branding research, and then age will be divided into different intervals. We do not delimit the consumers' age into specific numbers, because in marketing, consumers' age cannot be verified, but only be divided into children, adolescents, young and senior, according to their experience. Children are not an independent consumer group, so the

focus will be fixed on teenager group, young and middle aged groups and group of seniors.

Teenager group, which has a strong sense of rebellion and strong curiosity and keen perception of fashion, is an avant-garde and offbeat group. They walk in the forefront of fashion, but without sufficient financial capacity to pay, they just create something new and original in order to be different, but do not ask for perfection. Teenager group is fan of products with personality, and the guide of fashion.

Young and middle aged group, which has a strong sense of social belonging and self-consciousness, is a popular mainstream of fashion. They stepped into the society and gradually move toward success with the pursuit of social identity and different lifestyles. They have the financial ability, so they are called the leaders of fashion and suitors of individuality.

With high social status and personal achievements, the senior group has abundant financial capacity, but their perception of fashion is decreasing, their only concern is the pursuit of quality and personalized service. Having a strong sense of nostalgia, the senior group enjoys a stable life and tends to comfort, convenience and economy.

### 3.3.2 Brand management

Next we will take a look at different types of brand resources and abilities, so as to find out matching target markets and business strategies.

**Manufacturer Brand:** With production technology and processing capability, competitive advantage is reflected in product quality and cost control. Manufacturer brand should adhere to "quality first" principle, focusing on the development of consuming market of the senior group. Enterprises should enlarge the development of basic products and personalized technical services, delay the delivery time and frequency of popular products, and reduce the proportion of personalized products. The design of manufacturer brand should pursue the classic and low-key style with product's positioning at the high-end markets; the marketing of manufacturer brand should be based on traditional marketing channels, and establish individualized technical service system; in the production aspect, the cost and quality advantages should be adhered to. In addition, manufacturers brand can also take good advantage of the processing capacity and scale, with a view to initiating a marketing revolution, in which stores selling popular products are open to teenager consumer group.

**Retailer Brand:** With the channel resources and marketing technologies, competitiveness is reflected in the scale and marketing share. Retailer brand generally can be categorized into two kinds: one is department store chains cooperating with the designers to bring about advanced brands, serving the high-end groups of the young and middle-aged; the other is large supermarket chains cooperating with manufacturers to produce general brands, serving the senior group and basic demands.

**Designer Brand:** With the creativity and innovation of design, competitiveness is reflected in trends and uniqueness. Designer brand should highlight characteristics of style, focusing on the development of adolescents' personality or personalized consumer markets. Adolescents' personalized consumer markets should be designed to be bold, bright, without rigidly adherence to one pattern, at the same time it should reduce production costs and sale prices, generally by channels of boutiques or sale mode of storage-type. In the young and middle-aged markets, popular products should be designed as creative as possible, and design of personalized products should be unique and with good quality, generally by using the store chains and customized services. Designer brand also should develop complementary products which are closely related to clothing consumption, so as to give full play to the synergistic effects of the design and marketing in scope economy.

**Couture Service:** With the development of economy and the improvement of living standard, people pay more and more attention to personality and quality. From the real life to literary and artistic works, and as a result, custom demand of clothing products is increasingly growing. Custom demand is mainly from three aspects: one is that body types differ in thousands of ways, sizes cannot completely correspond to individual differences; second is the personalized custom demand of the successful people and special populations who intend to realize self-value, such as formal dresses of movie stars and people from upper circles of business and politics; three is the custom demand of characters in musical and literary works, such as the character shape in opera "Turandot".

Couture service is a kind of high-grade consumption service of clothing products, and it needs the highly interaction between designers and consumers, as well as the integration of marketing, design, and production. Couture brands cannot reuse the traditional handicraft industry pattern. It must use the latest technology and advanced mode of production, as well as explore the new way of industrialization by using computer and Internet technology.

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# A Study on the Service Innovation of Regional Telecommunication Operation Enterprises

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**Abstract:** With the development of telecom market, the center of the service innovation competition is the customer relationship management, which will also be the main one in China. Firstly, the thesis analyzes the definition and the necessity of the telecom service innovation. Secondly, the thesis listed some possible means of service innovation as the market develops, and divided the contents of the telecom service innovation into three layers, namely the core services layer, the form services layer and the extension services layer. Finally the thesis gives out the corresponding measures the telecom service innovation needs to take.

**Key words:** Telecom corporations; Competition; Market; Service innovation

## 1 Introduction

After the original China telecom's separation in May 2002, new China telecom and China Netcom were founded officially, and then China's telecom market has formed a coexist and comprehensive competitive situation among six comprehensive telecommunication operation enterprises, which are China telecom, China mobile, China Netcom, China Unicom, China satellite communications and China tie tong. The competition of the fixed telephone, mobile telephone, data services and other business areas can not only be found in the major telecom operators, but also can be found in various regions of the peers. The competition also exists in ways such as language sound and data intends to earn both new and old customers' preemption for the second service income. Since China's telecom market is still an emerging market, the price war is undoubtedly the most direct and effective means of competition using by the operators. The frequent mutual reduction expands both the telecom market and the number of customers. But it gradually makes the telecommunication operators becoming more and more passive in the competitive market. In order to survival and seek the development of enterprises, the telecommunication operation enterprises are in great need of innovative competition means. At the same time, with the continuous development and improvement of the telecommunications market, companies need to shift from pure price competition into customer-centric service competition. Since the 1980s technological innovation, which based on the service innovation, definitely provided a new choice for telecom operators. And it will also bring China's telecom competition to a new stage of development.

## 2 Telecom Service Innovation and Its Necessity

Telecom service innovation is the application of technology innovation in the telecommunication operation enterprises. Telecom service innovation is the telecommunication operation enterprises, which depend on the demand of social communication, using external technology conditions, rearrange and reorganize the enterprises resources (including funds, equipment and personnel), readjust the telecommunication service form and introduce new function telecommunication services and service realization, or improve original telecommunication service efficiency, to enhance the operation efficiency and economic benefit of the communication enterprises. It embodies in the increasing of services types, the strengthen of service function, the improving of service quality and communication network operation efficiency, the reduction of service cost and prices, the expanding of the original market share, the development of new markets, etc. The aim of the service innovation is improving social benefits for telecommunications companies, while seeking greater economic benefits so that they can take the initiatives in the fierce competition. Telecom service innovation generally includes three aspects: the innovation of the new function telecom, the innovation based on the same function of differentiation and the innovation of efficiency improvement and lower prices.

With the regulation of telecommunications market, the numbers of the enterprises involved in the Chinese telecommunication market will increase greatly. The continuously development and improvement of the telecommunications, making China's telecom market become a competitive buyer's market among several of telecom operating companies. Market economy is competitive, and the deeper level of the competition is the competition of the competitor's service cost and service innovation. Pure

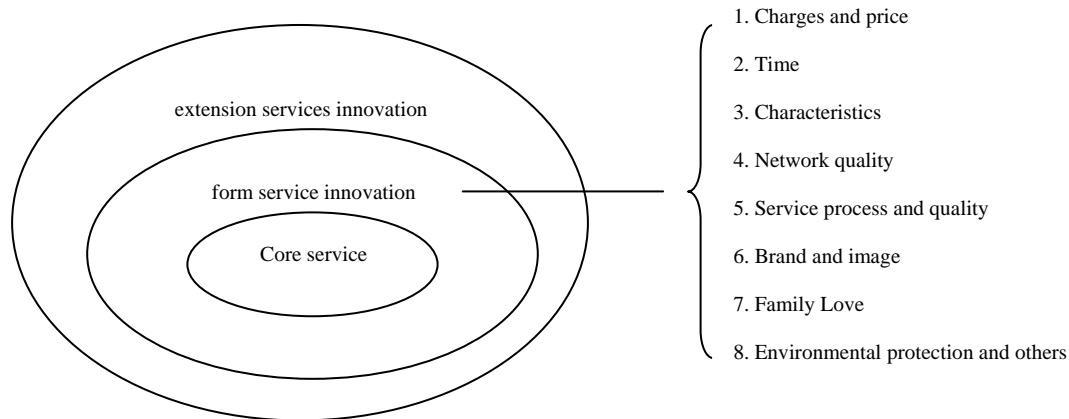
service price competition will be given priority to service innovation competition. The reason is that the price war mainly reflects two aspects. On the one hand, it is telecom enterprises' requirements of rise stage. In order to maximize profit, each operation manufacturer had to do everything possible to reduce costs and make their prices to be the lowest one in order to reap excessive profits. When many manufacturers successively upgrading technology, improving management and working to reduce cost, the old market price will correspondingly reduced, and the original excess profit that manufacturers have will no longer exists. But the companies which are the first to innovate technology and individual management, can make the product price lower than individual new social price, and can still sell them according to the society price so as to achieve the excess profit between social prices and individual prices and become the new excess profit winner. On the other hand, the price war is a short-term behavior that manufacturers take to reduce the backlog of products and upgrade products which is not likely to last long. When the manufacturers' product quality and price level are relatively stable, it will certainly enter a deeper, higher level of competition, and improving the service innovation. Competition is one of the most outstanding requirements. Therefore, it is an inevitable trend that the competition will shift from price competition to service competition for manufacturers' further development. According to the information provided by China Telecom, the first quarter of 2004, both the fixed telephone service traffic and the revenue growth emerged negatively. This is the main business's first negative growth in the history of China's telecom operators. Because of the application of innovation of Personal Access System, the net fixed income does not appear to be net negative. The fact is that offering the same service for a long time, rather than service innovation, will be out of the market. In the future, service innovation based on technical innovation will be the key to all parties' game. So the telecommunication operation enterprises need to attach great importance to service innovation, integrating consciousness and practical into telecom industry value chain.

### **3 Contents and Ways of Telecom Service Innovation**

The development of the telecom market and the increasing competitive pressure of it require the telecommunication operation enterprises to become a comprehensive information service provider. Due to the inseparability in the process of customer's consumption and manufacturers' production, and in accordance with the process and the different intensity of customer contact, the formation process of communication services can be divided into two levels, which contain six process, and they are network service layer (including the network planning design, network construction and installation, network management) and service delivery layer (marketing and business processing, pricing and charging, the customer service). Every innovation in telecommunications services represents the formation process's change in communications services.

China's telecom service innovation is generally based on technology-driven. Taken the coming buyer's market and consumer age into account, in order to enhance the customer consumption (customer number) and win the second consumption (customer communication cost) of the race, telecommunications companies need to shifting innovative ways from technology-based services to market-driven based services. Market driven service innovation, which is based on the demand of the market and production, will focus on market changes and customer needs in order to guide and create a telecommunications consumer trend. Market driven service innovation means taking the customer as the center, and discussing the process of service from different angles, and then improving the economic benefit of enterprises through the change of the enterprises internal resource allocation methods.

An important characteristic of the telecommunications service is the customer's deep participation. In the view of the customers, the services providing by the companies can be divided into three levels: core service layer, form service layer and the extension services layer. Correspondingly, the telecommunications service innovation can be divided into three areas (as shown in figure 1 below).



**Figure 1 Service Innovation Level**

**3.1 Innovation of core services layer**

Core services is benefit that consumers get by using services, namely the information (including voice, data, video and multi-media, graphic, taste, smell and touch and so on many kinds of) transfer. This kind of information which is passed both includes single information, a variety of comprehensive information. From the beginning of the voice to the graphic, then the multimedia will be able to transfer the sense of smell, etc. These are all new communication methods, and relatively speaking, they are also large service innovation. These new modes of services are out of the customers’ needs and technology requirements of the development itself, but the direction of innovation in the telecommunications business services also plays an important role in it. The emergence of new communication method will have a huge impact on the development of the telecommunications industry, so the telecommunication operation of enterprises should maintain a high degree of attention to core services level of innovation.

**3.2 Innovation of form services layer**

Although innovation of core services level has great influence, the innovation of form service layer is what the telecommunication operation enterprises face more often. Form service level is the consideration of consumers' purchasing, using and stopping the service. Combined with the telecom market now, main factors of innovation of form service layer can be divided into eight categories. Correspondingly as follows:

**3.2.1 Charges and price**

Price innovation includes the innovation of the use of price service, a combination of price and payment rates and other aspects. Because consumers' sensitivity of the problem related to price and charges, the innovation will undoubtedly be the focus of service innovation. In order to maximize customers' acquisition, network operating enterprises adopt zero price or free gifts and other benefits network. According to different consumer segmentation of dynamic zone, it divides different packages, IP telephone, flat-rate consumption, one-way charge, fill the lottery, mobile payment, scoring returns and 800 telephone calls and so on.

**3.2.2 Time**

Time innovation includes the time spent on providing services and customer uses and something relates to it. The innovation mainly includes real-time, urgency, the extension of time, billing in details, such as long distance of charging from the former to minutes instead of charging to six seconds billing, instant inquires the words fee, etc.

**3.2.3 Characteristics**

Characteristics innovation of service includes the innovation of service directional and interactive (one-way, two-way alternate, etc), features (a change, standardization, diversity) terminal mobile and so on. This is also the focus of future service innovation, such as Personal Access System comparing to a fixed telephone, mobile phone comparing to pagers, two-way charges, “do not disturb”, three-way calling, conferencing, etc.

**3.2.4 Network quality**

Quality innovation is mainly the innovation of network technology quality. Network technology quality includes the application of new technology, the existing network quality improvement, the

expansion of coverage, the use of regional customers narrowing and positioning, etc, such as ADSL's application, local tong, and so on.

### 3.2.5 Service process and quality

Service process and quality innovation is the innovation of a way to provide services to customers, customer relations contact mode, the process of providing telecommunications services, service establishments, and a reasonable set to change, contact the customer's personnel changes and other aspects. And it also includes the innovation of buying more services, using services, stopping services, transfer services and so on. In the process of the formation of the service, customers have a high degree of participation, and therefore offer good services to customers have a great impact. Promoting standardization and personalized, diversification, differentiation and convenient service, and taking the customer as the center of customer relationship management, these are all the focus of competition of the telecommunication operation enterprises now. And they are both the key and challenging factors to service innovation, such as services throughout a clear, call center of 10000 setting up, telephone marketing, mobile business hall, customer care, a pleasant surprise, the numbers presented in the telecommunications Act to carry, etc.

### 3.2.6 Brand and image

Brand and image innovation include the creation of a new brand, improvement and extension of existing brand, corporate image and changes in affinity. Brand is very significant to clients. The first thing the customer would think of when they buy services is the service brand of telecommunication, so the actions that the telecom operators take to offer their services and branding on their own will promote their own competitive advantage. Therefore, operating companies should consciously develop their own brand reputation, satisfaction and loyalty, such as China mobile's GSM, Shenzhouxing and China Unicom's campus Xinrui are performing well.

### 3.2.7 Family love

Due to our country's telecom market development and its unique social customs and habits, providing services while taking family love, friendship love and mood into account will have a good effect. There is Shenzhouxing family number, MMS, colorful bell in this area.

## 3.3 Environmental protection and others

Although telecom service is invisible, it all depends on the physical hardware carrier, so the local hardware innovation can be conducted. As environmental protection, aesthetics will also be a new luminescent spot after service innovation, like radiation of mobile phones and Personal access System, green consumption, 201 card collection function, etc.

## 3.4 Innovation of extension services layer

Innovation of extension services layer in telecommunications includes telecommunication industry's internal cooperation and television broadcast, finance, education and other industry fusion and cooperation. This is good to the telecom industry's long-term development and the telecommunication operation enterprises itself business, and it also adapts to the requirements of the future development's change trend of the telecommunication service operation.

Along with the development of the telecommunications industry and the formation of new industry value chain of telecommunications which is "equipment suppliers-basic network operator-content collector and producers-business providers-the customer", it requires telecom companies to change the past service business model from the traditional enclosed operation mode to the gradually open one, setting up the new management idea, and gradually establishing service mode of cooperation with other operators, value-added services, other comprehensive industry which adapts to market, like cooperation operation mode, the joint operation mode, the virtual operation mode, the joint operation mode, etc.

## 4 Measures Telecom Service Innovation Needs to Take

Since our country's telecom market is still in the primary stage of development, most the demand of customers are mainly basic voice telecommunications services and the demand for data business value-added telecom service is still in its infancy, so compared to the foreign telecom companies, China's telecom market has a lot of capacity. In this phase, the telecom enterprises service innovation must meet the requirements of customer partly, which means winning a greater market share while fostering the development of service innovation by new customers. Telecom companies should treat service innovation as a system and long-term work, but at this stage, more attention should be paid to the following respects.

### 4.1 Select the appropriate business service innovation strategy

Before the late 1990s, due to the monopoly of the telecommunications market, China's telecom enterprise mainly adopts the imitation innovation strategy. At present, with the international network of communications, our country already has a relatively strong infrastructure, and the demand of customer is shifting from monotony to multiplication, besides, China's telecom companies also have a comprehensive development ability, so the operation enterprises should choose different service innovation strategy according to their conditions and ability. Because of the constraints of the size of the network resources and customers' habitual consumption and brand recognition, instead of selecting the innovation strategy used by the leading telecommunications companies, some new enterprises like China Unicom and China tie tong should take advantage of the independent innovation strategy and the market segmentation, so as to strengthen itself. Competitive enterprises like China telecom and China mobile should prompt some following strategies like imitate innovation, joint innovation which based on market development, seeking to reduce the risk of innovation.

#### **4.2 Change the telecom enterprises leadership and the staff's service innovation concept**

The formation of telecom market competition pattern promotes the telecommunications business leaders and employees recognizing the importance of market competition and its urgency. But at this stage the competition of telecom enterprises focus on some primary respects like price competition. And with the development and perfection of telecommunications market, it needs the new ideas and means. Enterprises as the main body of innovation, its leadership needs to develop innovative tendencies and adventure spirit, in the mean time, employees have to develop the innovative ideas to meet the market demand.

#### **4.3 Train organization innovation in service innovation and enterprises culture**

The lack of service innovation, tissue culture and the corresponding enterprises culture give rise to the lack of enterprises innovation spirit and innovation tendency. At present, organization innovation of China telecom operating companies is mainly designed by the enterprises internal innovation group, and service innovation is still developed by technology research center. Only a small number of innovative enterprises set up a special department to lead the organization and business innovation. Therefore, enterprises should be adjusted according to their actual organizational structure of enterprises.

To make the enterprises innovation organization function effectively, it still needs to blend the innovation into enterprises culture, so that innovation can be integrated into every enterprises employee. Therefore the enterprises should develop employees' master consciousness, focus on the value of the individual, pay attention to the training staff's lifelong learning atmosphere, and the open environment. This will not only develop their creativity and enthusiasm, but also will improve the overall level of knowledge and competitiveness.

#### **4.4 Pay attention to service innovation and resource allocation**

Resources that service innovation needed are capital and the introduction of talent (especially the creative talents), construction of communication networks, and promotion of network marketing and expansion of customer resources. Talent and capital, which are the most important resources for innovation in telecommunications services, lay a good foundation to the telecom service. The later three resources are good to the promotion of service innovation.

#### **4.5 Abide by the service innovation process of standardization**

Telecommunications service innovation process includes market scanning and opportunity analysis, evaluation, selection of the feasibility analysis, service design, testing and commercial development, commercial promotion, service innovation and a summary of feedback. This is a loop and feedback models. Since various enterprises' service innovation items cross mutually, therefore it is also a crossover model. Because the innovation of input and costs is the primary innovation, so the promotion of service innovation should comply with the service standardization, so as to reduce the risk of service innovation.

## **5 Conclusion**

With the continuous improvement of the China's telecommunications market, the business competition becomes more fierce and complex, and the enterprises must get rid of today's price competition and shifting into the high-level competition namely the service innovation competition. Although telecom enterprises service innovation is still at the primary stage, as long as the telecommunication enterprises are good at finding their service innovation, it will be able to compete in a dominant position and obtain the expected benefits.



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# Technology Learning of Integration Innovation Through Informal Relationships: The Case of Machine Tool Industry in China

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**Abstract:** Some existing studies of successful development of equipment industry emphasize the need to focus on formal channels of technology acquisition to allow latecomers to catch up. However, this reasoning neglects the fact that in some industries, including traditional equipment industry sectors, much knowledge can be acquired by informal means. Through the study of machine tool industry in China, this paper shows the significance of informal learning activities in the development of traditional industries and the possibility for latecomer firms to climb the technological ladder through exploiting various informal knowledge relationships.

**Key words:** Technological learning; Integration innovation; Machine tool; Equipment industry

## 1 Introduction

The findings from the successful experience of high-tech industries in China have not only seemed to dominate our understanding of the recent development of developing countries, but have also led to the emergence of policy suggestions that emphasize an alleged need to focus on formal means of technology acquisition to drive the technological upgrading of industry in China. However, many scholars have argued that generalizing from such high-tech centered theoretical models and policies has serious limitations. In addition, it is a manufacturing-driven, high-throughput industry where labor costs play a crucial part in competitive advantages. Therefore, that experience might not apply to industry with different characteristics. The dominant science-based policy discourse has also been criticized for neglecting the significance of other dimensions of learning that are taking place in some traditional industries in which technology building may be based largely on apprenticeship, learning by doing, work routines, informal networks, employee training and experiential knowledge<sup>[1]</sup>. etc.

According to that, this paper argues that the existing high-tech industry-centered development models emphasizing formal learning channels should not be generalized to all other industrial sectors in developing countries. For one thing, these models are insufficient to account for the catching-up of traditional equipment industry in some developing countries that do not share the characteristics of the high-tech industries. Furthermore, as opposed to the predominant view that stresses that the industrialization of the developing countries has been stimulated by formal learning mechanisms, I argue that the technological advance of a latecomer equipment industry may actually be nurtured by informal learning mechanisms established and exploited by firms.

By using the case of China's machine tool(MT) industry, this paper deals with issues related to the technological capability building and learning of equipment industry. Although the MT industry has not been studied in the same depth as the electronics industry in recent years, China was the first largest MT producer as indicated table 1 and sixth largest MT exporter in 2010 in the world. Based on the in-depth interviews with technology researchers in MT firms conducted in 2010 and 2011, I empirically investigate the strategies and resources used by Chinese MT firms to build their technological capabilities. On this basis, the article enhances our understanding of the factors contributing to, and the underlying mechanisms and institutional environment behind.

## 2 Special Features of Innovation and Learning in the MT Industry

### 2.1 Innovations in the machinery industry

Innovation differs considerably across sectors. In the so-called knowledge-intensive industries like IT or biotechnology, knowledge inputs are often derived from reviews of existing research, and knowledge generation is often radical in nature and based on the application of widely shared and understood scientific principles and methods through formal R&D activities. Innovations in the machinery industry, however, are often based on the application or novel integration of obtainable knowledge with low levels of R&D<sup>[2]</sup>. They are largely incremental and often arise from the machinery firms persistent efforts to satisfy requests from users.

The most recent and widely recognized technological innovation in the machinery industry is

perhaps the wide adoption of computer numerically controlled (CNC) technology since the 1970s<sup>[3]</sup>, which made machinery more flexible and easier to use through the utilization of programming devices. In the MT industry, the radical technological breakthrough in electronic innovations, however, did not bring about radical changes in industrial structure. Instead, MT firms adapted well to the new technology by using external suppliers for control systems and for the technical assistance needed to incorporate micro-electronic components into their machines.

**Table 1 Machine-tool Production in Millions of U.S. Dollars**

No.	Country	-- Production --		
		2010		
		\$-Millions	% Cut	% Form
1	China, Peoples Rep	19,980.0	73%	27%
2	Japan	11,841.7	89%	11%
3	Germany	9,749.9	70%	30%
4	Italy	5,166.4	53%	47%
5	Korea, Rep. of	4,498.0	69%	31%
6	Taiwan	3,803.3	77%	23%
7	Switzerland	2,185.4	84%	16%
8	United States	2,026.2	72%	28%
9	Austria	908.9	64%	36%
10	Spain	812.0	66%	34%

Source: Gardner Publications, Inc.

With the emergence of CNC technology, the application of electronics has become a critical aspect in the development of advanced machine tools. But the core competencies of MT firms still rest firmly in the mechanical field, as the design principles and technologies embodied in the most advanced machinery still remain largely mechanical. Although the improvement of knowledge in electronics demands more R&D-based learning, the accumulation of mechanical competences that tend to be more art-based still need to be acquired through on-the-job practices in the forms of learning by doing<sup>[4]</sup>.

### 2.2 Learning by imitation

In addition to learning by doing and using, imitation is a widely used way of learning in the MT industry. In fact, even Japan's MT industry began by copying foreign machine tools and gradually absorbed advanced technology as well as developing its capabilities to introduce product innovation based on imported models<sup>[5]</sup>. Imitation is often regarded as the demonstration of a lack of creativity and talent, as well as not being innovative. Japan's success, however, has made people re-evaluate the meaning of imitation in industrial development. Not only is imitation often the first step towards learning to become innovative<sup>[6]</sup>, but firms endeavoring to imitate also require capacities similar to those needed for new product innovation. This capacity calls not only for engineering skills to take an imported machine and produce a simplified and cheaper version of it, but also for a reasonable level of design capability to introduce quality improvements without raising the price.

In the case of China, the original source of design for most MT firms has also come mainly from imitating foreign products through reverse-engineering, in which MT firms scrutinize and analyze all of the technical details and specifications of the target products, such as structures, layouts, parts, components, and materials. Through their involvement in analysis and reproduction, MT firms were gradually able to accumulate technical competence and experience in manufacturing. Later, they tried to make incremental changes to the imitated product, such as incorporating new functions or using different parts or materials, to adapt to local manufacturing conditions or to meet customer requirements. To remodel the machines successfully, they not only had to reconfigure the mechanical elements, but also needed to devise ways to tackle problems resulting from the design changes. In the process of constant redesigning and problem-identifying and solving, the indigenous technological capabilities of Chinese MT firms have been further strengthened.

### 2.3 The role of experienced engineers

Manufacturing experience may have little to do with quality improvement in some industries like IT, but it is a critical source of learning and competence in the machinery sector. Much mechanical technology remains tacit or non-codified in a written form. It is largely developed and cultivated through shop-floor and practical experiences, and embodied mostly in the engineers directly involved in the everyday manufacturing activities.

Experienced engineers play a critical role in enhancing the innovative performance of MT firms. As mentioned earlier, innovation in machine tools, especially in the mechanical portion, relies heavily on recombination and incremental changes. In this context, given their higher absorptive capacity, experienced engineers are likely to be able to handle such tasks faster and more efficiently than inexperienced ones. With prior experience and accumulated knowledge, they are more effective in assimilating the technologies and screening design ideas or components applicable to the new projects from the existing knowledge pool, as well as more skillful in identifying and solving emerging problems, greatly helping their firms to reduce the amount of trial-and-error in developing new machines. Their experience and skills are also of critical importance to MT firms imitation projects.

### **3 Technology Learning through Informal Vertical Relationships**

#### **3.1 Cooperating with the users**

In the development of the MT industry, scholars especially emphasize the important role of technologically sophisticated indigenous users, such as the automotive and automation industries. With the assistance of these advanced users who possess significant problem-solving capabilities in the user-producer interaction process<sup>[7]</sup>, MT builders improve their technological competence. Therefore, it is easy to observe that countries such as Germany, Japan, which currently lead in the global MT industry, also have strong domestic automotive industries or automation sectors, not to mention that these industries are often the largest buyers of machine tools. Yet in the case of China, since domestic automobile companies use mainly imported equipment and most MT firms domestic clients are small machinery workshops with weak technical competence, some MT firms do not seem to expect much in the way of advanced technology inflows through these channels.

##### **3.1.1 The users as innovation stimulators and machine testers**

The role of these relatively technologically backward domestic users, however, should not be neglected the upgrading of MT industry in China. To accommodate the requirements of their indigenous users, Chinese MT makers are spurred to devise ways of improving the functionality of their machines while managing to keep them in an affordable price range for their local clients, who are mostly small machinery workshops with limited capital. For this reason, the current strength of Chinese MT firms in the global market, especially in the segments of low-to-medium-end and multipurpose machine tools, is considered to be largely stimulated by their indigenous users.

When developing new machines, Chinese MT firms also rely on their trusted users to assist them in machine testing. The workers of their user firms would be more experienced in operating machine tools than the MT firms own engineers and therefore could more effectively detect the flaws of new machines. At the same time, in these local users' metalworking shops, the functionality and reliability of a new machine could be tested in situations that cannot be simulated in MT firms' in-house testing. As these Chinese metal working shops are known for operating their machines in harsh conditions, such as working around the clock and using machines to perform various processing procedures, MT firms can expect their new models to receive the strictest testing in their users' workshops, helping to optimize the final products.

##### **3.1.2 The users as technology mediators**

In the past, when undertaking to imitate foreign products, Chinese MT firms might have first imported the machines of interest from foreign makers and then dismantled them for detailed inspection. Today, however, they rarely deploy such strategies, given the high cost of importing these high quality machines as well as the increasing difficulty of purchasing them, as foreign MT makers have become aware of their Chinese counterparts hidden intent in purchasing their products. In this context, the relational networks of Chinese MT firms with indigenous users give them an alternative and more economical way to access advanced technological know-how.

To get instant feedback on machine use, an important input for improving products, MT firms need to send out their staff regularly to visit users. Since some MT users might have purchased foreign advanced machine tools for sophisticated processing, their knowledge and experience of using imported products is useful for product improvement by MT firms. Moreover, this offers Chinese MT makers a chance to have an inside look at these machines by taking advantage of their relationships with the machine owners. In addition to opportunities for physical inspection, machine owners may provide the instruction manuals that contain detailed specifications and guides to operation and trouble-shooting. These manuals also serve as a complementary knowledge source, helping engineers employed by Chinese MT firms to extract and comprehend the know-how embodied in the imported machines.

### **3.2 Know-how diffusion and sharing facilitated by the suppliers**

Chinese MT firms are competing against each other with similar products on the international market. In contrast to the existence of intense vertical interaction between MT makers and their users, horizontal interaction among domestic MT firms has been sparse. Their cut-throat competition in the market has made it hard for them to work together. Except in rare cases in which domestic firms selling different products might help each other out by supplying complementary products for marketing, cooperation between MT makers, especially in terms of technology or product development, has been almost non-existent. Nevertheless, mutual learning by domestic MT makers in the cluster has been surprisingly vigorous.

Suppliers are active facilitators circulating information and know-how among firms in China's MT. These suppliers provide services for multiple MT firms and may very well possess specific information or know-how concerning their respective clients. They therefore serve as a great source for firms wishing to dig out their rivals unrevealed information. For instance, Chinese MT makers sometimes adopt aggressive learning strategies to steal their competitors know-how. These include private inspections of competitors products through the assistance of local suppliers. They would ask suppliers to let them inspect the machine tools that the suppliers just purchased from other domestic MT firms. Sometimes, even without being asked, suppliers actively give their client MT firms the chance to check the components of their competitors' new products.

## **4 Technology Learning through Informal Horizontal Relationships**

There is a consensus that latecomer industrial development especially need non-local knowledge to precipitate further upgrading and higher levels of competitiveness<sup>[8]</sup>. In the case of China's MT industry, however, there are institutional barriers between foreign technology suppliers and MT firms resulting from the existing and potential competition between both parties in the market, the latter's limited resources to induce the former to initiate knowledge transfer, and the latter's intention of pursuing business autonomy. Therefore, the knowledge inflows through formal relationships with foreign technology sources have rarely materialized. Endowed with limited capacity or opportunities to be involved in formal transnational contractual arrangements, Chinese MT firms have to tap foreign scientific and technical competences through alternative channels, which are often informal in nature.

### **4.1 International product exhibitions**

International product exhibitions have been identified as an efficient marketing instrument for Chinese MT firms. They provide low-cost access to new markets that would otherwise be unapproachable. By attending international trade shows, MT firms can gain access to a large number of current and prospective global users in a short span of time. Nevertheless, international product exhibitions serve more than just marketing functions for Chinese MT firms. They also provide a platform on which the learning activities of Chinese MT firms are practiced and some of their extra knowledge linkages are built.

During product exhibitions, MT manufacturers derive ideas for new products and technologies from analyzing their competitors products, gathering data on specifications, prices, related technological and marketing information, etc. This information is of critical value to them in making future products and marketing plans. Besides gathering publicly available information, Chinese MT firms make more aggressive efforts to learn from their technologically advanced competitors. These sorts of learning activities, however, do not actually happen during the exhibition period of an international trade show, but prior to its opening. International product exhibitions are also an important venue to which firms come to search for partners around the world that exhibit interesting products and capabilities. For Chinese MT firms, their collaborative relationships with overseas partners in sales, marketing, production or product development are often established during the shows.

### **4.2 Licensing of technology**

Negotiating directly with the technology owners to transfer the needed technical know-how through license agreements is one way for latecomers to acquire advanced technology as well as to build up endogenous capabilities in a short period of time. Such strategies have been employed by MT industries in countries like Japan, Korea, where MT firms used licensing as a key strategy to acquire all the elements of design and production know-how related to their target products or technologies with the support of their parent conglomerates or their governments<sup>[9]</sup>. In China, however, licensing has rarely been a feasible option for MT firms in need of advanced technology. Most Chinese MT firms do not have sufficient resources to engage in licensing. Due to their smaller production and sales, it is also

hard for them to negotiate favorable deals with technology owners.

Nevertheless, some Chinese MT firms have been involved in licensing arrangements with foreign firms. But, such investment decisions seem to have come largely involuntary. The success of China-made machine tools based on copying products from countries like Germany, Italy, Japan, and the US has threatened the business of some of these advanced MT makers in world markets. To avoid lengthy and costly international lawsuits, foreign firms that have suffered from aggressive imitation may choose a direct approach to Chinese MT makers who they believe are the blind imitation. Such confrontations may end up in strategic alliances between the two rivals through signing formal licensing agreements or becoming production or business partners.

## 5 Conclusion

As opposed to the popular view that the industrial upgrading of latecomers was fostered through formal learning channels, in the evidence of MT industry in China suggests that it is the proliferation of informal learning mechanisms established and exploited by firms that mainly precipitates the learning dynamics in the industry. Just as technological capacity building in machine tools is in general characterized by incremental learning on the shop-floor, MT firms gradually accumulated their technological competence through constant learning by manufacturing and imitation, both of which have been facilitated by integration innovation in China. The production advantages enable Chinese MT makers to ramp up sales quickly in the world market, which brings them abundant opportunities to practice learning by manufacturing. The institutional environment of the integration innovation also nurtures various intra-firm informal learning mechanisms, allowing the firms to source extra-firm knowledge locally.

The technology acquisition of China's MT industry demonstrates not only the significance of informal learning in traditional equipment industries, but also the possibility for a latecomer firm to climb the technology ladder through exploiting various informal learning mechanisms. Even so, I do not suggest that such informal learning by itself is sufficient to support the sustained development of firms in this industry. Nor do I downplay the importance of formal learning channels, such as R&D. On the contrary, I argue that, to keep stimulating further technological advance, Chinese MT firms should recognize that informal learning cannot be a full substitute for formal learning. Instead, the two are complementary. More specifically, to continue to exploit foreign sources of knowledge through informal channels, Chinese MT firms especially need to enhance their absorptive capacity by increasing R&D investments<sup>[10]</sup>, thereby breaking the technological ceiling established by the forerunners, it is particularly crucial for Chinese MT firms to build and explore alternative foreign informal learning channels.

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# A Study on Innovation Situation and Strategy of Guangxi Province of China Manufacturing Industry

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**Abstract:** This paper first introduces the innovation background of Guangxi province of China Manufacturing Industry, and then analyzes the current innovative situation of Guangxi Manufacturing Industry, from the total input and strength of the innovation, the situation of the outputs and the characteristics of innovation. And on this basis, it points that the Problems which is existed in the innovation development of Guangxi Manufacturing Industry, and put forward some strategies and recommendations to improve the innovative capacity of Guangxi Manufacturing Industry.

**Key words:** Manufacturing Industry; Innovation Situation; Statistic Analysis; Innovation Ability

## 1 Introduction

At present, the level of manufacturing industry development in Guangxi is not high, compared with other provinces' manufacturing development, it ranks on the list. Though, with the 'Eleventh Five-Year' efforts Guangxi has made significant progresses in the manufacturing industry, cultivated a number of competitive national brand and well-known enterprises, such as LiuGong Machinery Co., Ltd, Guangxi Yuchai Group and SGMW Co., Ltd. But in our region the total output of manufacturing is not large, with low industrial level, the irrational structure, low-tech and weak innovation, the conclusion is that in the total manufacturing industry of Guangxi, less competitive situation is not change at all<sup>[1]</sup>.

Currently, the most critical issues of Guangxi manufacturing industry is how to upgrade industries and how to create value efficiently. In order to upgrade industrial structure, which provides an rare opportunity for Guangxi international undertake and domestic technology transfer. This is an opportunity to form a massive capacity of international undertake and domestic technology transfer in Guangxi, and a inevitable choice to realize the optimization of resource distribution and upgrade the industrial structure<sup>[2]</sup>.

The State clearly announces that it is important to make efforts to promote industrialization and optimize industrial structure, focus on improving the level of comprehensive utilization of resources and ecological environment protection. Therefore, improving the ability of independent innovation will be the key to upgrade the industrial structure and changes to growth within the Guangxi region. This paper will analyze the current innovative situation of Guangxi Manufacturing Industry from the total input and strength of the innovation, the situation of the outputs and the characteristics of innovation.

## 2 Innovative Situation of Guangxi Province of China Manufacturing Industry

### 2.1 Innovation input of Guangxi province of China manufacturing industry

(1) Total amount of investment in Guangxi manufacturing innovation indicators

The total amount of Guangxi Manufacturing Industry innovation input indicators in the country is in the bottom row (see Table 1). In 2008, Guangxi has the activities of scientific institutions and manufacturing companies in science and technology, respectively accounting for 1.2% and 1.2% of the total manufacturing sector. In Zhejiang Province, scientific institutions and science and technology activities of manufacturing enterprises accounted respectively for 24.3% and 26.5% of the total national manufacturing sector, In Jiangsu Province, respectively, accounted for 14.7% and 18.4%. In 2008, Guangxi science and technology activities manufacturing personnel and R&D personnel accounted for the total number of the country's manufacturing technology R&D activities, personnel 1.0% and 0.7%. While Manufacturing S&T activities in Guangdong and R&D personnel accounted for 13.0% and 17.5%, Jiangsu accounted for 12.8%, respectively, and 11.8%. Guangxi manufacturing industry Innovation can be seen behind. In 2008, Manufacturing science and technology activities in Guangxi R&D funding and expenditure activities, respectively, accounted for the total expenditure of the country's total manufacturing technology R&D funding 1.1% and 0.7%. And other manufacturing industries are far from developed provinces. R&D funding in manufacturing science and technology activities and

expenditures in Jiangsu are accounted for 15.8% and 15.25%. Equipment accounts for the country's total investment in manufacturing microelectronic control equipment 0.9%. Among them, Jiangsu, Guangdong, Zhejiang, microelectronics manufacturing equipment into the country's total control of the proportion was 17.8%, 15.0%, 9.2%.

**Table 1 Gross Indices of Innovative Input in Manufacturing Industry in Guangxi Province of China**

Area in china	The number of technology enterprises / sector	the number of enterprises with technology activities / sector	science and technology activities staff / people	scientists and engineers / people	R&D person / people	funding for science and technology activities / million	funding for R&D / million	micro electronic control equipment / million
National	22156	48637	3091848	1978975	1014223	61604847	26813110	146032189
Guangxi	261	579	31407	19486	7083	652158	196087	1344605
Beijing	556	1858	93313	68065	26892	2026597	709676	5793649
Tianjin	400	952	74199	45998	21799	2488439	897905	1894396
Hebei	475	887	91791	60446	25362	1373841	728740	5644652
Liaoning	441	1062	121778	82304	39987	2621740	1289771	6079331
Jilin	164	312	45463	29201	8273	708228	253053	3082996
Heilongjiang	155	363	67237	43174	26642	878258	480800	1705669
Shanghai	617	1121	104792	69152	36692	3269105	1811127	8078058
Jiangsu	3265	8947	394884	236018	119553	9713366	4090217	25936335
Zhejiang	5386	12897	311948	176018	79366	5526379	1935081	13462241
Shandong	1722	2568	273131	181161	107535	6571538	3453962	10503826
Guangdong	2292	3989	402183	292433	177500	7026906	4109579	21938605

Source: China Science and Technology Statistical Yearbook 2009, and the regional Statistical Yearbook 2009

(2) The intensity indicators of the input of investment in Guangxi manufacturing innovation

Most of the intensity indicators of the input of investment in Guangxi manufacturing innovation are in the country's middle row, some in the bottom row (see Table 2).

**Table 2 Intensity Indices of Innovative Input in Manufacturing Industry in Guangxi Province of China (%)**

Area	Enterprises with science and technology institutions account for all the companies	enterprises with science and technology activities of the total business	scientific and technological activities of the employees	the proportion of scientists and engineers account for Scientific and Technological Activities	The proportion R&D personnel of the employees	science and technology activities expenditure of the main business income	R&D funding of the main business income	the proportion of microelectronic control equipment of original price of production and operation device
National	5.3	11.6	3.5	64	1.1	1.2	0.6	10.8
Guangxi	5.2	11.6	2.7	62	0.6	1.2	0.5	7.1
Beijing	7.7	25.8	7.6	72.9	2.2	1.4	0.9	12.4
Tianjin	5.4	12.8	5.6	62	1.6	1.8	0.8	4.2
Hebei	3.9	7.3	2.9	65.9	0.8	0.6	0.3	10
Liaoning	2	4.9	3.3	67.6	1.1	1.1	0.6	7.9
Jilin	3.1	5.9	3.5	64.2	0.6	0.9	0.3	10.5
Heilongjiang	3.5	8.3	4.3	64.2	1.7	1	0.6	4
Shanghai	3.3	6	3.4	66	1.2	1.3	0.8	9.7
Jiangsu	5.1	13.9	3.6	59.8	1.1	1.4	0.7	17.1
Zhejiang	9.3	22.3	3.8	56.4	1	1.2	0.7	15.2
Shandong	4.1	6.1	2.7	66.3	1.1	1	0.6	9.2
Guangdong	4.4	7.6	2.7	72.7	1.2	1.1	0.7	14.9

Source: China Science and Technology Statistical Yearbook 2009, and the regional Statistical Yearbook 2009

1) from the view of the establishment density of innovative organizations and the implementation density of innovation activities, in 2008 the manufacturing industry in Guangxi, especially enterprises with science and technology institutions and technology activities accounted for all manufacturing enterprises in Guangxi, 5.2% and 11.6%, Compared to the national manufacturing industries, especially enterprises with science and technology institutions and technology activities accounted for 5.3% and



11.3%, essentially flat.

2)from the view of the input density of the creative talents, in 2008, scientific and technological activities in Guangxi manufacturing industries accounted for 2.7%, including scientists and engineers account for 62.0% of technological activities, while the R&D personnel accounted for 0.6% of total employees.

3)From the view of the intensity of the input of innovation funds, in 2008, in Guangxi manufacturing industries, funding in the scientific and technological activities and R&D expenditure were 1.2% and 0.5% of main business revenue, and compare to the national average, essentially flat.

4)from the view of the input of innovative automation facilities investment, in 2008, in Guangxi manufacturing industries, this indicator was 7.1%, below the national average, and is far behind 17.1% in Jiangsu, 15.0% in Zhejiang, And 14.9% in Guangdong.

## 2.2 The situation of the innovation outputs of Guangxi Province of China manufacturing industries

Innovation output is an important indicator which can reflect the innovation capacity of the enterprises, to some extent, innovation ability of an area is mostly reflected in the innovation output of enterprises, while there are two indicators reflect the innovation output: new products and patent applications.

### (1) Situation of new products of innovation in Guangxi manufacturing industries

In 2008, the situation of new products of innovation of the major provinces' manufacturing industries can see table 3. It can be seen that output value of new products and new product sales in Guangxi manufacturing industries accounted for, respectively, 0.9% and 1.0%, in Guangdong Province, the two indicators reached 13.4% and 13.1%, In Jiangsu Province, both reached respectively 12.5% and 12.7%. In addition, in Guangxi manufacturing industries, the proportion of output value of new products and the total industrial output value is 9.4%, the proportion of total sales of new products and main business income is 11.3%, which is almost the same with the national average, but compared to Beijing and Tianjin, there is a larger distance, the two points marked in Beijing reached 29.1% and 27.1%, are located in the first of the country, and in Tianjin, the two sub-standard proportions were 22.6% and 21.3%, which is located in the second of the country.

**Table 3 New Products Information of Manufacturing Industry Innovation in Guangxi Province of China**

Area	output value of new product / million	Sales of new sales / million	the proportion of output value of new products and total industrial output value /%	the proportion of sales revenue of new product and main business revenue /%
National	585227473	570270986	11.3	11.3
Guangxi	5536319	5941510	9.4	11.3
Beijing	30308746	30589115	29.1	27.1
Tianjin	28187577	27501772	22.6	21.3
Hebei	10572869	10685885	4.6	4.8
Liaoning	19824273	19196748	8	7.9
Jilin	16388333	12104628	19.5	14.9
Heilongjiang	4751014	4529219	6.2	5.5
Shanghai	47255773	48948483	18.8	18.8
Jiangsu	72901516	72434173	10.7	10.9
Zhejiang	67532379	64081539	16.4	16.1
Shandong	56312044	55876878	9.1	9
Guangdong	78621730	74695491	12	11.8

Source: China Science and Technology Statistical Yearbook 2009, and the regional Statistical Yearbook 2009

### (2) Patents information of manufacturing industry innovation in Guangxi

The number of patent applications for Guangxi manufacturing industries is in the bottom row in the country(table 4). In 2008, the number of patent applications in Guangxi is 1074. The number of invention patent application is 306, ranking first is Guangdong, which has 10,882 patent applications, ranking second is Jiangsu, 6502 and ranking third is Zhejiang, 6107, Guangxi falls far apart. In addition, in 2008, Guangxi has a number of 568 patents, the number of projects accounted for 1.3% of the number of technology projects, the number of new product development projects account for 1.1% of the total new product development projects, these data show that the situation of innovation patent in Guangxi

manufacturing industries is bad, and need urgent improvement.

At the same time we should notice that, although the situation of innovation patent in Guangxi manufacturing is not good, but the number of innovation patents in China manufacturing industries is continue to rapidly increased, which provides a good environment for development of innovation patents in Guangxi manufacturing industries, but if we does not improve the quality of patent, we can not change the status of backward.

**Table 4 Patents Information of Manufacturing Industry Innovation in Guangxi**

Area	The number of projects of science and technology	The number of new product development projects	the number of invention patent applications	the number of patent applications	The number of invention patents
National	286209	184859	173573	59254	80252
Guangxi	3631	2124	1072	306	568
Beijing	15093	8312	7124	4256	5618
Tianjin	13045	8567	5227	2754	3050
Hebei	6829	3874	1855	603	1058
Liaoning	11719	5959	3678	1383	1496
Jilin	3275	2043	867	297	480
Heilongjiang	5303	2602	1320	421	1002
Shanghai	12966	8785	8288	2651	3111
Jiangsu	33384	23579	21901	6502	9688
Zhejiang	32966	27423	33652	6107	11098
Shandong	24113	14605	14276	4125	5453
Guangdong	30527	22357	38958	18802	18757

Source: China Science and Technology Statistical Yearbook 2009, and the regional Statistical Yearbook 2009

### 2.3 The characteristics of the results of innovation of Guangxi manufacturing industries

From the view of national main economic areas, in 2008, in the registration of the results of innovations, the four economic zones have higher levels of outcome evaluations, in which the results of the Yangtze River Delta and Pearl River Delta Evaluation is relatively higher, while Guangxi is located in the western of China, not in the four economic zones, the level of innovation evaluation is relatively lower (see table5).

**Table 5 Evaluation Results on Innovation Achievements in the Main Economic in 2008**

the level of innovation evaluation	The Bohai Sea		The Yangtze River Delta		the Pearl River Delta		The Northeast area	
	Composition %	Increase in the proportion	Composition %	Increase in the proportion	Composition %	Increase in the proportion	Composition %	Increase in the proportion
International Advanced	6.82	0.63	7.03	0.2	5.13	-2.4	6.32	0.41
International Leading	23.53	-0.37	28.49	1.52	15.61	-4.44	22.78	-0.18
Domestic Advanced	52.64	0.09	49.2	-0.97	58.64	4.33	46.56	-0.14
Domestic Advanced	15.28	-0.07	14.31	-0.24	18.06	0.81	22.45	0.09
General domestic	1.73	-0.28	0.97	-0.51	2.56	1.7	1.89	-0.18

Source: China Science and Technology Statistical Yearbook 2009, the regions' National Annual Statistics report of scientific and technological achievements in 2008.

## 3 Conclusions

### 3.1 Problems of Development in Guangxi Manufacturing Industry

(1) There are a small number of enterprises with scientific institutions and science and technology activities. It accounted for respectively, 5.2% and 11.6% of all enterprises in Guangxi, slightly lower than the national average, it is still very far from Beijing, Jiangsu, Zhejiang and other developed

provinces, these two indicators, Zhejiang Province respectively reached 9.3% and 22.3%, Beijing, is 7.7% and 25.8%.

(2) There is shortage of talent in manufacturing industry innovation. Technological activities only accounted for 2.7% of employees, the number of employed scientists and engineers, accounting for only 1.7%, below the national average 3.5% and 2.2%.

(3) Intensity of investment funds is relatively low, intensity of investment in R&D of Guangxi manufacturing industries, was only 0.5%, lower than Zhejiang, Guangdong and other provinces, these provinces have reached by 0.6% or more, higher than the national average, 0.6%.

(4) The proportion of microelectronic equipment and the original cost of production and operation equipment are low for Guangxi manufacturing industries; it is 7.1%, lower than the national average 10.8%.

(5) The output value of new products of Guangxi manufacturing industries and the total sales income of new product were not much more, but the proportion of the output value of new products and the total industrial value is 9.4%, and the proportion of the total sales income of new product and the main business income is 11.3%, which is close to the national average.

(6) The number of science and technology projects and new product development projects are small; only share 1.3% and 1.1% of the state.

(7) The number of patent application of Guangxi manufacturing industries and invention patents is still low in the country, the situation is not optimistic, the number of patent applications and invention patents respectively owned the country's total share of 0.6% and 0.7%. Data show the number of patent applications in the manufacturing industries in Guangxi and several patents is far behind the domestic developed provinces.

### 3.2 The Strategies of Improving the Innovation Ability of Guangxi Manufacturing Industry

(1) Emancipating the mind, changing the concepts

At first, pay attention on the ideology, secondly, to change their concepts, not only to learn from some domestic provinces with good manufacturing industries, but also to learn from the advanced countries in the world, especially learning the experience and model of the developed countries, and making a solid ideological foundation for Guangxi manufacturing industries innovation<sup>[3]</sup>.

(2) To strengthen the various input in innovation

Human resources have become the company's core resources, and it is also a key to innovation. Financial resources are the protection of innovation. With a solid ideological foundation, coupled with adequate human resources, financial resources, it is better to promote the development of manufacturing methods and accelerate the optimization and upgrading of industrial structure.

(3) Improve the efficiency of government functions, strengthen innovation to the institutional

Support and assist from the government in terms of innovation like the sun on the seeds. Guangxi government not only should fully play its role in providing good innovation environment and good infrastructure for Guangxi manufacturing industries, but also design plans and policies for development of innovation of Guangxi manufacturing industries, coordinate all aspects, truly uniform the government awareness, economic laws and scientific laws.

(4) To adjust the industrial structure, promote industrial upgrading

In the organizational structure of enterprises, we should increase the efforts in industry's integration, through the methods such as mergers, acquisitions, alliances, restructuring, etc., to develop and nurture business advantages, the introduction and mastery of some of the core technology are also necessary. In the economic structure of enterprises, we should vigorously adopt strategies such as advance and retreat, some things to do or poor selling to do to restructure and adjust the state-owned economic structure and state-owned assets<sup>[4]</sup>.

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# Study on Innovation Subject Model of Logistics Industry Based on Self-Organization Theory

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**Abstract:** Operational efficiency of Logistics industry innovation system has significant functions on industrial innovation and regional economic development. According to the basic connotation of the creative industries, the paper firstly identifies the key bodies of logistics industry innovation system. Then it builds a four-dimensional key body model based on self-organization theory. Finally the paper divides the model into government guiding form, enterprise and universities promoting form and collaborative developing form according to different leading driving elements, thus establishes a modern logistics industry technology innovation system which centers on the four key bodies.

**Key words:** Logistics industry; Innovation system; Four-dimensional model; Self-organization principle

## 1 Introduction

The word “innovation” first comes from J.A. Schumpeter’s book named Theories of economic growth and development<sup>[1]</sup>. Schumpeter proposes that innovation system contains product innovation, technology innovation, market innovation, resources innovation and organizational innovation. Hugo Pinto summarizes the evaluation indexes of regional innovation system as a four-dimensional structure which contains Human capital, technology innovation, labor market conditions and economic structure<sup>[2]</sup>. In Asheim’s opinion, regional innovation system can be regard as a regional cluster which is surrounded by multiple supporting agencies<sup>[3]</sup>.

The industrial innovation ability reflects a certain industry's comprehensive ability of improving production efficiency, forming industrial competitiveness and promoting sustainable development through technical innovation, organization innovation and management innovation.

For many years, nationwide scholars have revealed that technical innovation is significantly important in the processes of economic and social development, and have advocated that all of the market bodies shall locate technical innovation in the primary position of innovation. Zhang Liquan defines technical innovation as the building process of an operation system which is more efficient and saving by first using new products, techniques and processes<sup>[4]</sup>. Liu Lu & Du Zhiping analyze the connotation of logistics industry innovation of knowledge economy age and provides theoretical references for the establishment and implementation of policies of logistics industry innovation by discussing the system's structure, operation mechanism and characteristics from three different levels<sup>[5]</sup>.

Can see as a result from the above research, actually, theoretical studies about Chinese logistics industry innovation system are few, much less researches of applying self-organization theory to logistics industry innovation on macroscopic level. Based on the above statements, this paper clearly proposes a four-dimensional key body model for logistics industry innovation system, then combining China’s national conditions, it aims at seeking breaches of China’s logistics industry through analyzing the innovation system’s evolvement and the relationship between the leading driving element and other ones in different developing stages.

## 2 The Key Bodies of Logistics Industry Innovation System

### 2.1 Subject identification

Logistics industry innovation system can be divided into three layers ( core layer, assistant layer and peripheral layer) and four key bodies(logistics professional enterprises, public service units, logistics demand enterprise and government departments).

### 2.2 Role of the key bodies

#### 2.2.1 Logistics professional enterprises

Logistics professional enterprises locate in the dominant position of logistics industry chain, and the internal innovation ability of logistics professional enterprises cluster determines the overall creativity of logistics industry technological innovation. Logistics professional enterprises' functions on innovation system can be showed in three aspects, one is independent innovation and patent application,

the second one is introduction and simulative innovation, the last one is collaborative innovation. Logistics professional enterprises locate in the core layer of logistics industry technological innovation system.

2.2.2 Public service units

In logistics industry innovation system, public service units is mainly refers to those high learning institutions and science research institutions which are engaged in logistics theory research and looking for opportunities to apply theories into practice, they are the subjects and sources of technological innovation. Public service units locate in the assistant layer.

2.2.3 Logistics demand enterprises

Logistics demand enterprises here are those manufacture companies. On the one hand, large-scale manufacture enterprises will put forward higher requirements for the punctuality and lean sex of logistics service so as to gain a competitive advantage in the face of fierce market competition. On the other hand, the demands from manufacture companies will also aggravate internal competition between logistics professional enterprises, thus to promote these enterprises improving service through continuously adopting advanced technologies for gain market share. Logistics demand enterprises also locate in the assistant layer.

2.2.4 Government departments

Government is the subject of logistics institutional innovation. Policy direction from government has significantly impacts on logistics technology research & development, mainly displaying in the following aspects: creating healthy market environment, promoting mutual trust between key bodies, establishing compensating mechanism of innovation, improving the living quality of the logistics industry. Government departments locate in the peripheral layer of logistics technological innovation system.

### 3 The Four-Dimensional Key Body Model Based on Self-organization Theory

#### 3.1 Self-organization principle in logistics technological innovation system

Logistics industry innovation hierarchy is a dynamic system. It's also a complex system at the same time since its subjects are interdependent and interact with each other in a nonlinear way. Therefore, the process of Logistics industry technological innovation system fits the self-organization theory, and we can study its evolution with self-organization related theory.

Since the relationship between any two innovation subjects is nonlinear, the realization of orderly evolution of the innovation system is mainly determined by subjects' coordinative interaction, competitive interaction, and so on. Fluctuation refers to a certain variables behaves from average value thus causes the system to get out from the original rail or state. When logistics industry innovation ability system is stable, the fluctuation of system can't change its macroscopic state, but when the system is in critical condition, the micro-fluctuation will be amplified by the nonlinear effect and the system will transit from an unsteady state to a newly well-organized one, thus presents a dissipative institution. This is also the self-organization process of the innovation system which caused by the result of quantity influences quality. As showed in figure 1.

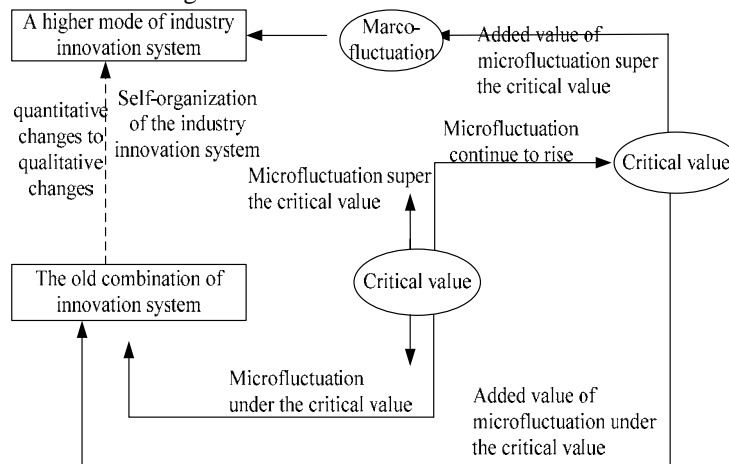
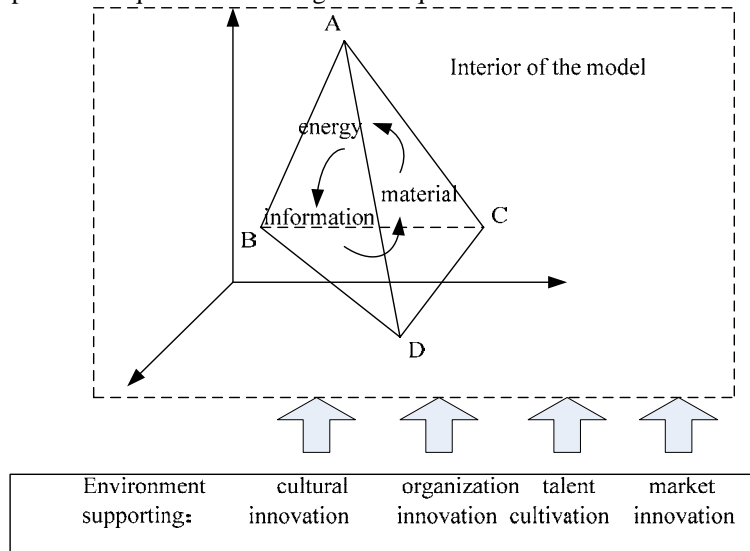


Figure 1 The Evolution of Logistics Innovation System Based on Self-Organization Principle

Figure 1 shows that the micro-fluctuation of the system is dominating the subjects' combining ways, and the stronger the fluctuation, the easier the formation of new combinations. Only when the micro-fluctuation is powerful to surpass a critical value (the minimum level for maintaining the system's original state) will it impact on the old combining pattern, break the balance, and gather energy for a new system. When the fluctuation is strong enough to reach another critical point, old pattern and system then completely disappears and an optimized technological innovation system takes shape, thus completes the leap from the quantitative change to the qualitative one.



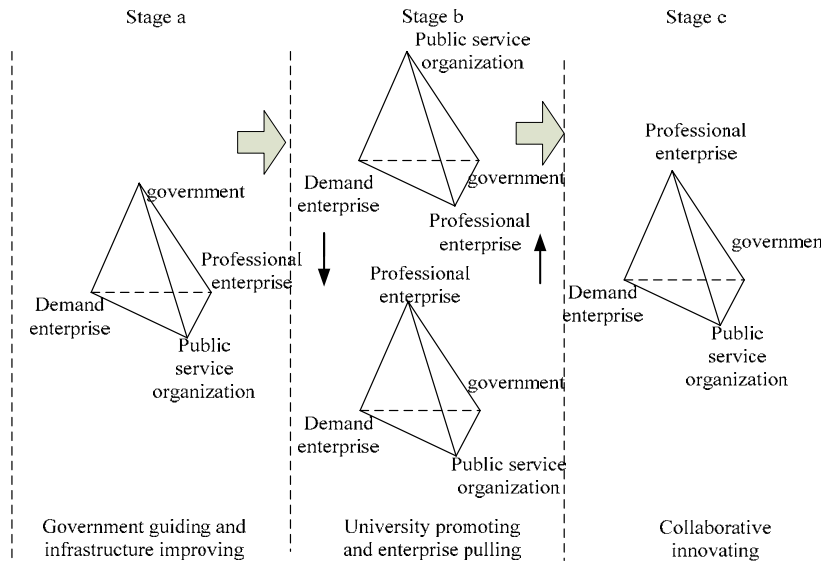
**Figure 2 The Four-Dimensional Key Body Model**

**3.2 The four-dimensional key body model**

Cooperation between subjects of the logistics industry innovation system tends to evolve to optimize the whole organization automatically. Figure 2 shows a four-dimensional key body model which is made up by logistics professional enterprises, public service institutions, logistics demand enterprises and government departments, denoted by A, B, C, D respectively. In the driving of the four bodies, the comprehensive ability of logistics industry technological innovation increases rapidly. In the interior of the model, information, energy and material flow circularly, and outside of it, cultural innovation, organizational innovation, talent innovation and market innovation offer support. In the following model, subject A locates in the top of the tetrahedron, playing the key driving role, B, C and D locate in the bottom, being basis of the tetrahedron, while the four key bodies supporting the formation of the innovation system together through interaction and coordination.

**4 The Model's Evolvement in Different Stages of Logistics Industry**

The four-dimensional key body model can be divided into three developing stages based on the different driving elements, namely as government guiding and infrastructure improving stage, university promoting and enterprise pulling stage, collaborative innovating stage (See Figure 3).



**Figure 3 The Model's Evolvement in Different Stages of Logistics Industry**

In the stage of government guiding and infrastructure improving, logistics professional enterprises, logistics demand enterprises and public institutions(including universities and research institutions) are situated in the bottom of the tetrahedron, and government is located in the top place(see figure 3, stage a). In the initial period of the development of the innovation system, government's main functions are: encouraging investment in science and education; speeding up platform construction of logistics Industry; improving relevant laws and strengthening the protection of intellectual property; deepening the reform of the public services and promoting technological innovation in logistics enterprises; supporting enterprises' R&D with funds, information and policies.

The task of this phase primarily is establishing logistics industry infrastructure and enhancing strength of main bodies. Other assignments like promoting the development of science and technology, encouraging public service organizations' R&D are also necessary.

With the continuous improvement of the innovation mechanism, the four-dimensional key body model progresses accordingly, and the university promoting and enterprise pulling stage comes into being (see figure 3, stage b). In this stage, public institutions gather a lot of talents and advanced lab equipments , and can provide vast quantities of advanced theories and abundant human reserves. During this time, public service institutions should strengthen the configuration of research effort's and human resource building so as to promote the materialization of new knowledge and new technology.

Logistics professional enterprises begin to play their role as a bridge, promoting new technology trade, transfer and common development when the model steps into the collaborative innovation stage (see figure 3, stage c). In this stage, logistics professional enterprises are in the top of the model. The coordination procedures between the key bodies are: manufacturing enterprises update their logistics needs continually; public service institutions develop logistics technology tailored the needs and transfer them to logistics professional enterprises; logistics professional enterprises apply new technology into logistical fields, then feedback the materialized effects to public service institutions. This period, government departments mainly provide guidance, supervision, encouragement and security for the procedures.

To sum up, this evolving mode of logistics industry technological innovation system accords with the basic laws of industry development. When the model is in its best condition, it presents as a tetrahedron, and not only the efficiency but also the stability of the innovation system are all the best.

## 5 Conclusion

Logistics industry innovation system in itself is open and self-organized, it is exchanging information, energy and material with the other systems such as the human society system, industry system and so on. By differentiating the main bodies of logistics industry into three layers, dividing the evolving model into three processes, and using the self-organization theory to study the innovation system as a whole, the paper explains the necessity of logistics industry innovation system evolving

from a low-level formation to a high-level one, and provides theoretical references for the development of China's logistics industry technology system

Logistics industry innovation system is a complex system, and how to quantitatively study logistics industry technological innovation system's maximum profits remains to be thought about.

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## Conversion Mechanism of Product Life Cycle Value Space

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**Abstract:** Conversion mechanism of product life cycle value is the key factor of enterprises' survival and development. Study on the product life cycle theory is such an important topic that has become the basis of enterprise's determining the characteristics of the product in order to meet the needs of the market. This article on the product life cycle theory combines with Apple and Motorola Company product sales analysis in recent years, it concludes the value space conversion mechanism of product life cycle.

**Key words:** Product value; Product life cycle; Product value space; Conversion mechanism.

### 1 Introduction

In a product life period, businesses often need to amend their marketing strategy. This is not only due to the economic environment and market competition factors, it depends on the stage of the product's life cycle. Life cycle concepts do not only serve as basis in assisting product developers understand the dependencies between products and their life cycles, they also help in identifying potential opportunities for improvement in products.<sup>[1]</sup>Therefore, enterprise needs to develop a range of strategy to meet the demands of the product life cycle, to keep pace with the requirements of the purchasers' interest. While many products can not last forever, but manufacturers would always want to extend the duration of their lives. This study combines the product life cycle theories with market, with the analysis of characteristics in different product's life cycle, it focuses on value space conversion mechanism of product life cycle.

Product life cycle theory was proposed by Harvard University professor Vernon in 1966. Father of modern marketing management Philip•Kotler in his book "marketing principle" mentioned about product life cycle (abbreviated as PLC) .<sup>[2]</sup> Product life cycle has five phases: development period, lead-in period, into long-term, maturity period and decline period.

Banwari Mittal and Jagdish N.Sheth put forward the concept of value space in 2001, whose value space consists of performance, price and personalize, which is called "3P".

In the life cycle of product value space, the core value of the product will change with the changeable circumstances. Enterprises through improving the value of the product itself, constantly update and adjust (increase, maintenance, removal and improvement) the core value of the products, to create the formation of new product, and meanwhile take measures to reduce the product or service and operating costs, finally enterprises can win greater profits through more effective business process and operation way.

According to the understanding of the psychological demands of consumers, the investigation of periodic product share of the market , appropriate marketing business strategies can be formulated in a timely manner; Analysis on the market of the product life cycle enables enterprises to eliminate old products and innovate the core values of products to meet consumers' demands, improve the structure of consumption, increase product range and supply , which is helpful to rapid replacement between old and new products in a timely manner, gaining the initiative for business management; According to the sales situation of product life cycle value space, companies can take measures to try to shorten investment period to ensure high economic growth period, extend the maturity as much as possible, delay products' wane , bring more profit opportunities for the enterprise, increase vitality and competitiveness, provide enterprise with more new market share to fully enhance corporate reputation.<sup>[3]</sup>

### 2 Conversion Mechanism of Product Life Cycle Value Space

The dynamics of product life cycle for a family of products presents a complex manufacturing scenario.<sup>[4]</sup>According to economic activities of enterprises, a product cycle of creating it's value is generally divided into a series of distinct but interdependent economic activities such as planning, design, product development, manufacturing, sales, service, and recycling. This economic activity has lay the basis for the management of enterprise product life cycle. According to this, the value of space

conversion mechanism has become external performance of the product life cycle conversion.

The principles for product design planning and the logical process of product design planning process and contents based on Product Value Space was put forward.<sup>[5]</sup> In life cycle process of the product value space, the core value of the product will change with the changing circumstances in the market competitions to some degree, while the basic value in the life cycle changes with the change of the product life cycle, as shown in figure 1.

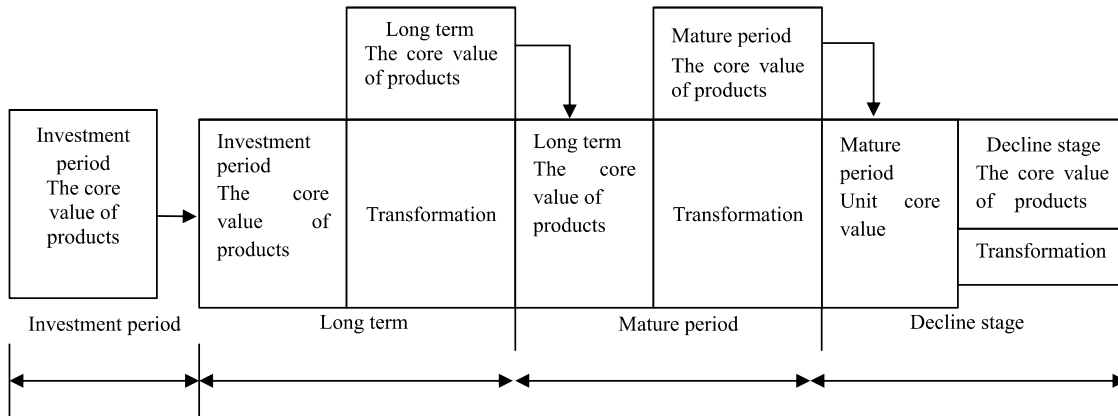


Figure 1 Product Life Cycle Value Consistency

Transformation of Value space involves in the whole field of business in enterprises, each value cycle makes the different contribution to the creative value of enterprise, which is determined by a variety of different market environment factors, the activities of value space in each cycle becomes the important factor of product life cycle. The product life cycle has its consistent rules in value: in the life cycle of product value space, the core value of the products will change to some degree accordingly as the market competition changes, and the fundamental value of the products will change constantly with the changing life cycle. Thus, it's very necessary to explore conversion standards of the product life cycle space value from the important element: value.

**2.1 Investment period**

Enterprises make scientific forecast combining theory and elements based on the value space of the product's life cycle. With the analysis of the product space value, Enterprises identify the cost of product life cycle, and analyze its value elements, with a large amount of research materials, Enterprises can find out those popular elements in the market, which needs small cost, but grows at a faster pace. On the basis of the element, enterprises can control products' life cycle, and determine the target market, ultimately it is helpful to the product promotion and enlarging reproduction.

**2.2 Growing to maturity**

In growth stage of the life cycle, product sales gradually increase, the product sale price and the product itself competes each other, and it has a certain consumer groups in this stage, meanwhile, the enterprise has a clear understanding of its brand. At this point, the enterprise should pay close attention to innovation and development with the core value of products, improvements should be made in technology, function, appearance and so on, partial product design is supposed to be emphasized, to find new core value of the product, while retaining the product's original good function in the market, thus reducing the product manufacturing cost and make more profit for the enterprise. According to the product core value conversion, enterprises should adapt to a positive attitude, develop a new strategy to attract more consumers to expand sales.

**2.3 Maturity period**

Enterprises in mature stage have achieved greater economic interests, should make a judgment in time to take measures to extend maturity period. Through market research and consumers' information feedback, enterprises make improvements timely, such as: To improve packaging and appearance quality, supported by advertising, then put on the market as soon as possible; to expand product applications, to improve the service, lower the prices, improve performance and enhance product reliability. This can significantly improve the market competition ability and improve market share, which can significantly extend maturity period.

**2.4 Decline stage**

The industrial level increases ceaselessly due to advances in technology, products update more quickly, severe competition in the market causes the product life cycle is shortening constantly. When the old products are in maturity period, enterprises should organize to develop new products, invest more money and technical equipments in a new generation of product development and research. According to conversion mechanism of the product life cycle value space, the continuous upgrading of products are supposed to be guaranteed, in order to ensure the steady growth of enterprise production and management.

Products in different phases of the cycle, hold different characteristics of the sale, therefore, research on conversion mechanism of product life cycle value space is of great significance to the consumer, the market and enterprises.

### **3 Empirical Research: Analysis and Comparison of the Value Space Conversion Between Apple and Motorola Mobile Phone**

After the failure of Apple Macintosh laptop sales, there's a new viewpoint within the company, that is, major reforms were necessary in the organization management modes and operating mechanism. They were not eager to squeeze in the fierce market competition, but took the time to make products more perfect. Apple basic strategy is to rely on their professional technology, to develop the distinctive products for the sake of consumers. These products help enterprises to hold the price advantage, to earn high profit for the company, thus enabling it to put in more money, and continue to create more attractive products. Apple has a unique set of complete system about the product value, firstly, this set of criteria must integrate with the concept of enterprise development and the concept of value.

Secondly, the set of criteria should have their own characteristics, when the criteria are established, the corresponding design standards should also be constructed, including the corresponding design ideas and program, thus the design unity can be guaranteed.

Apple for a new concept of product design tends to provide three assessment documents, that is, a market development document, a project design document and a user experience file. Through the market survey, Apple can understand what consumers need; through engineering design, Apple can explore what to do; through the user experience, Apple can find out about consumers' consumption tendency and preference. If the three files are evaluated and accredited by executive committee, the design group will get a budget and appoint a person in charge of the project.

From then on, the project team is committed to enriching the three assessment documents, that is to focus on how to realize the specific requirements in the market development, engineering design and the user experience, and then the details such as issue date, advertising cycle, price will be taken into consideration.

Simplicity is Apple's pursuit in its products. Jobs said "no", not just because he hated complex things. Apple product profit rate has been very high, saying "no" to new products, new features can help Apple to maintain low production cost, getting rid of certain function is also beneficial for the next generation of products. "The biggest benefit of omitting certain function is that consumers will become more eager to have them when you meet certain requirements of consumers in the new version, which even can make them happier." Former Apple engineer Reed said. Apple has repeatedly played this game, the recent example reflects in iPhone4, it includes the processing function in multiple tasks that consumer has been eager for from 2007. Based on Apple's focus on value function above, therefore, Apple is successful.

As the biggest beneficiaries of the first generation mobile communication, Motorola wanted to extend the life cycle of analog mobile phones as far as possible, and delayed the popularity of digital machine. Motorola overestimated the life cycle of analog mobile phones, when many other competitors launched various compact digital mobile phones, Motorola will find their own slow tempo.

Motorola attempted to build a general-purpose operating system as its development on the same platform for mobile phone in the future. Motorola picked the wrong platform and select Java, Java is insurmountably congenitally deficient, which is too slow. Later for its insufficient performance on the mobile platform Linux, many software from third party unable to load, such as: input method software of mobile phone, video software, and finally Motorola lost the best chance of unifying mobile phone operating platform. Motorola looked down on Nokia and Samsung which tend to "change a case or the color as a new mobile phone", however, users are really happy with that change. When consumers want to design the mobile phone by themselves, Motorola don't follow the tendency.

With the help of Android system, Motorola tried to return to the road of innovation, Motorola

mobile phone embraced its real turning point from V3. At the same time Motorola began to play a role as the guide to the consumer and the user on the basis of technology. In the fierce competition for the market share, Motorola launched a “decisive battle”: try to get back to the leader position of market share through reducing its price. China is one of the main battlefield in the war, many people remain fresh in one's memory: Motorola mobile phone gave consumers a remarkable impression in reducing price, The most classic mobile phone V3 was priced from more than 6000 RMB in 2004 to 1200 RMB in 2006, after several years the number of improved version mobile phone V3 became an ordinary thing.

The first Motorola mobile phone product came out on November 7, 2009 which based on the platform Android. Subsequently, a series of Motorola products called Milestone came out in succession, the Android platform is famous for its powerful function, people tend to call Milestone a milestone. Just as the name, the series of mobile phone called Milestone played a role like a milestone in the development of Android.

At present, Motorola still has some advantages after other enterprises have adopted Android as the platform for intelligent mobile phone, For example, brand influence on users in market, advanced in management experience, improved distribution channels, strong research and development technology, and good cooperation with Google and telecom operators.

But it is still a question for Motorola whether it can continue to go forward, which is determined by the reform in its production and marketing in the whole operation system, whether it can take users the first priority, and manage differently and effectively in different cities.

Poverty stirs people to change, change tends to go with a smooth way, and then going forward for a longer time. With the reform, there is a long way to go for Motorola this time, but Motorola retained the original competitive advantage, on this basis, Motorola revolutionized successfully and got its new beginning through considering the situation carefully, complying with tide, making a positive change, adopting the new technology, combining new mode and a new platform with the original resource properly. At least, Motorola got started again and inspired a new vitality.

#### **4 Conclusion**

With the study of product life cycle, enterprises can know cost status and competitive advantage of products on macroscopic and microcosmic level. According to the product life cycle, enterprises can make reasonable estimation and control reasonably, and thus to make reasonable prediction for enterprises, which offers great help for the profitability.

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## Change and Optimization of Henan's Rural Logistics Market in Economic Transition Period\*

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**Abstract:** Being an agricultural province, the development of Henan's rural logistics has important impulse activity to realize the rise of center China. The paper implies that the research on Henan's rural logistics market's change discipline and optimization in the period of economic transition is more important than before. employs many approaches such as system engineering, regional economy, etc. clarifies the system feature of Henan's rural logistics market, studies dynamic trend on the base of the statistical data from 1996 to 2011, sets up an optimization model which contains six latitudes and eight factors. Meanwhile, the paper takes the preliminary explore about how to further optimize Henan's rural logistics market.

**Key words:** Economic transition period; Rural logistics market; Feature; Dynamic trend; Optimization

### 1 Introduction

Being the main battlefield to reform, vast rural areas depended on household contract responsibility system, rural economy achieved rapid development in China. The statistics shows that agriculture as a proportion of gross domestic product (GDP) moved as high as 33.17 percent<sup>[1]</sup>. rural logistics market is showing a vitality, it was called "the third profit source" of rural economy. A lot of questions which unceasingly propel process of economic transition also causes a profound impact to rural logistics market, such as rural productivity increase slowdown continues.

Transition has been primarily used in medicine application, extended to economics category. Buhalin was the first to propose the economic transition when researched the transition from market economy to planned economy. At present, the theory circle hasn't reached a definitive conclusion, believes it is a radical change that economic structure and economic system of a country or region over a period of time, includes economic system upgrade, change in the main source of economic growth, economic structural promotion, and mainstay industry interchange, also is a process from quantitative changes to qualitative changes.

Any countries or regions will face the economic transition, many developed countries also have a transition process to further optimization economic system and economic structural. China's economic transition started at 1978, its objective model to establish socialist market economy, China has gone through a big transition, finalize the design mode of the development in be market economy country in 2003.

### 2 The Features of Henan's Rural Logistics Market in Economic Transition Period

Up to by 2011, total population of Henan province reaches more than 100 million, particularly less than 60 million rural population. The growth of rural total retail sales of consumer goods, for the first time, exceeded the growth of city, rural logistics market has been increasingly unpopular, becoming the highlight of Henan economy. Bases on more indexes such as the rural total retail sales of consumer goods, the sum of GDP, gross grains, the net per capita income of rural residents and per capita inbound, demonstrates Henan's rural logistics market.

The system involves agriculture product, produce to sell, the life of rural residents and others economic activity, refers to transportation, storage, loading and unloading, package, distribution, message processing in rural areas<sup>[1]</sup>. It is a special type of regional logistics, the target is various types of production, agricultural product, goods for everyday consumption by agricultural industry. At first, rural logistics let agricultural product how to go out, increase farmer's income, try means to acquire all kinds of production, agricultural produce, goods for everyday consumption. From Figure 1, Henan's rural logistics market which reach are not attained by a sudden flight, are not set in stone for the long term, which cross of abstufung and radical, and are growing dynamically. In this paper, it is showed a system,

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described and illustrated its character from the view of input, output, management, restrict and feedback link.

### 3.1 Input

Including various types of agricultural product, goods for everyday consumption, order, money, labor, material by agricultural industry. It has characteristics of variations of form, the first is seasonal nature<sup>[2]</sup>. The seasonal nature of agricultural produce brings about the seasonal nature of request of product material, consumption is also periodic. the second is imbalance, the different of Henan rural climate and geology leads to various types of rural logistics, refers to the imbalance request which agriculture, Lin, vice, fisheries and other economic to order.

### 3.2 Output

Including the process of transportation, store, sales of agricultural produce. It has characteristics of variations of form, the first is various, the imbalance of input brings about the various of output, breed the core product is the key. The second is particularity of output carrier, leads to more specific requirement to transportation, store, distribution because its various<sup>[2]</sup>.

### 3.3 Management

Management refers to the transition process of Henan rural logistics market from input to output in economic transition period, which includes many factors, is the key to reduce rural logistics cost. It has characteristics of variations of form, the first is logistics infrastructure construction legs rural logistics in developing. The second is low standardization. the third is practical application of logistics modern technology is limited, the idea behind if management. the last is rural logistics employees primary quality on the low side.

### 3.4 Restrict

Restrict refers to the restrain which Henan rural logistics is developing in the economic transition by system internal and external factor. It has characteristics of variations of form, the first is inefficient, many relevant preferential policies did not come true. the second is not strong capability to positively cope with these changed circumstances.

### 3.5 Feedback

Feedback refers to reverse direction of messages in system operation, such as the adjustment about rural logistics policies, modification of agriculture product request, implement of many relevant preferential policies about goods, etc. It has characteristics of variations of form, the first is high macro situation, rural problem was important priorities for China government. The second is big flexible character, must fellow the law of market economy in competing in the domestic and international markets. The third is flexibility, such as the activity of promoting household appliance in countryside is stoking consumption, also satisfying high-level enjoyment of rural residents<sup>[3]</sup>.

## 3 The Dynamic Change Index of Henan's Rural Logistics Market in Economic Transition Period

Listed in Table 1, expressed the rural total retail sales of consumer goods as Henan's rural logistics quantity demanded indirectly, took up the indexes sampled data of correlation such as gross grains, the net per capita income of rural residents and per capita inbound at a time. To facilitate the description, in this paper, we write  $K$  for dynamic index in a period, write  $X_a, X_b$  for the initial index value and final index data in a period, write  $n$  for length of research time, as in (1).

$$K = \frac{X_b - X_a}{X_a} \times \frac{1}{n} \times 100 \quad (1)$$

If dynamic index  $K$  is positive, there is a growing attitude what the larger the dynamic index that the faster growth, the smaller the dynamic index that the slower growth. If dynamic index  $K$  is negative, there is a decreasing attitude what the larger the dynamic index that the slower growth, the smaller the dynamic index that the faster growth. To facilitate the description, in this paper, we expand 100 times the calculated value, China has gone through a big transition, finalized the design mode of the development in be market economy country in 2003. Based on the statistics data from 1996 to 2010, the following conclusions can be drawn.

From 1996 to 2003, the dynamic index of he rural total retail sales of consumer goods is 25.12, the dynamic index of the Henan's GDP is 14.42, the dynamic index of net per capita income of rural residents is 9.05, the dynamic index of the rural total retail sales of consumer goods diversification is 7.83, it follows that it is obvious that Henan's rural logistics boosted GDP growth, it is positive that

Henan's rural logistics impacted net per capita income of rural residents. But we can see lack of momentum of consumption expenditure of rural residents continued, is not suitable for the rapid growth of the rural total retail sales of consumer goods. In this period, it shows radical change because the dynamic index of the rural total retail sales of consumer goods and GDP interchange are more higher, of course, from another view, we can analyze that Henan's rural residents consumption market is potential to mine.

**Table 1 Indicators Data of Henan's Rural Logistics Market(1996-2011)**

Year	Rural Total Retail Sales of Consumer Goods (10 <sup>8</sup> yuan)	The Sum of GDP (10 <sup>8</sup> yuan)	Gross Grains (10 <sup>4</sup> ton)	Net per Capita Income of Rural Residents(yuan)	Per Capita Inbound of Rural Residents (yuan)
1996	223.83	2988.37	3466.50	1231.97	1067
1997	363.07	3634.69	3839.90	1579.19	1313
1998	417.98	4041.09	3894.66	1733.89	1404
1999	463.43	4308.24	4009.61	1864.05	1373
2000	501.39	4517.94	4253.25	1948.36	1339
2001	555.88	5052.99	4101.50	1985.82	1551
2002	613.82	5533.01	4119.88	2097.86	1647
2003	668.78	6035.48	4209.98	2215.74	1734
2004	729.90	6867.70	3569.47	2235.68	1819
2006	806.84	8553.79	4260	2553.15	2156
2007	895.80	10587.42	4582	2870.58	2372
2008	1007.04	12362.79	5112.30	3261.03	2556
2009	1161.40	15012.46	5245.20	3851.60	2833
2010	1307.26	18407.78	5370.00	4454.24	3208
2011	1487.69	27232.04	5510.09	5019.76	3709

From 2004 to 2011, the dynamic index of the rural total retail sales of consumer goods is 13.18, the dynamic index of the Henan's GDP is 28.00, the dynamic index of net per capita income of rural residents is 16.54, the dynamic index of the rural total retail sales of consumer goods diversification is 12.73. It is suitable for we recalled that rural productivity increase slowdown continues. In particular, when the dynamic index of GDP turnover almost tripled, the role of agriculture may be attenuated during the economic transition period. The data suggests that the promoter action of the design mode of the development in be market economy country to the rural logistics market after the transition period is obvious, there is a "rapid rise" of Henan's net per capita income of rural residents and per capita inbound, has huge market prospect.

## 4 The Optimization Model and Path of Henan's Rural Logistics Market in Economic Transition Period

### 4.1 Optimization model

How to coordinate "effective anti-back" of Henan's rural logistics market system, correctly handle the issue of "going out" and "bringing in", it is particularly critical to deal with these problems for optimizing Henan's rural logistics market. To better solve these problems, in this paper, we established optimization model, the model is divided into six latitude and two facets of eight elements from the frame, as seen Figure 1.

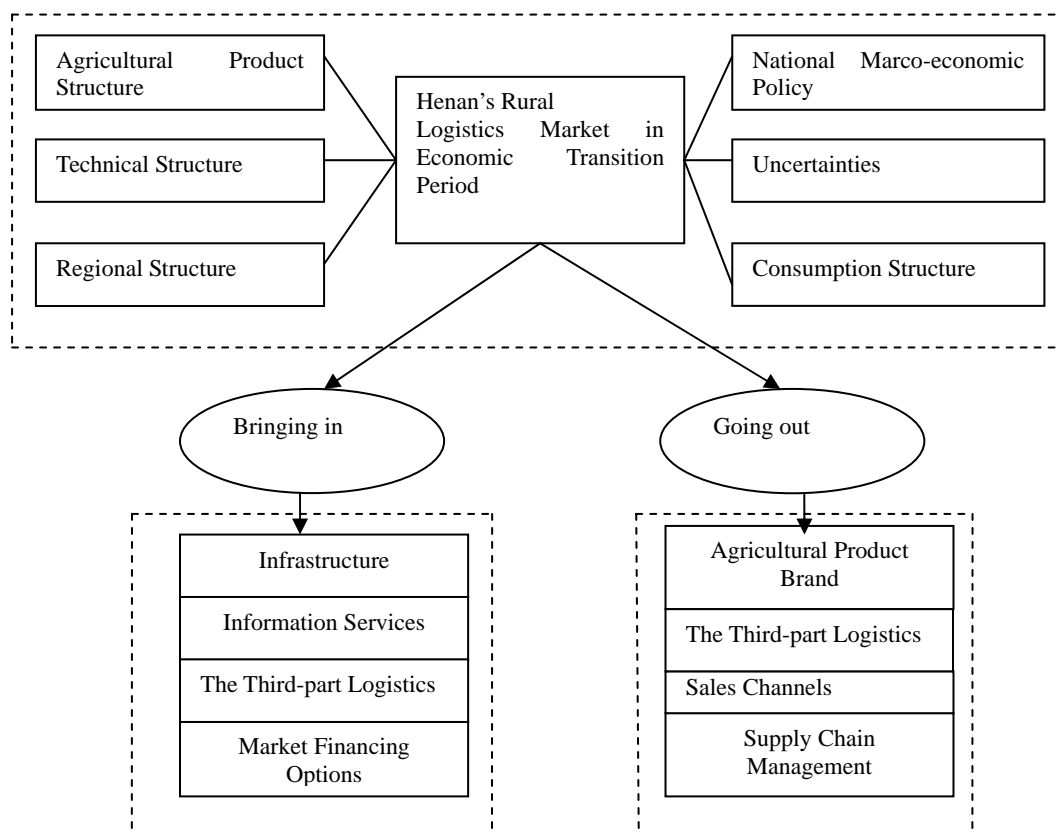
There are six latitude that including the national macro-economic policy, agricultural product structure, technological structure, regional structure, consumption structure and uncertainties. Two facets is the optimal goal, specifically, the previously described "going out" and "bringing in", there are four elements such as infrastructure, information services, the third-part logistics and market financing options in "bringing in", on the other hand, there are four elements such as agriculture product brand building, supply chain management, the third-part logistics and sales channels in "going out".

### 4.2 Optimization path

(1) Continue to accelerate the construction of rural logistics infrastructure, decrease effectively the cost of rural logistics

Due to the specificity of a situation, rural logistics market are facing development bottleneck

because poor rural logistics infrastructure, in order to decrease the cost of rural logistics, we must strengthen facilities. This paper says that mainly to improve transportation condition, build information platform and agricultural products storage (including cold storage), distribution centers, etc. With the facts, give the recommendation that attempt to be led by the government, organize qualified enterprises, farmers, research institutions, continue to accelerate the construction of Henan’s rural logistics infrastructure.



**Figure 1 Optimization Model of Henan’ Rural Logistics Market in Economic Transition Period**

(2) Paying close attention to brand building, unblocking sales channels<sup>[4]</sup>

It has own characteristics of agriculture products in Henan, must follow the road of scientific planning and overall management. Specifically, particular regions maybe cultivate brand product, adhere to the road of brand. Moreover, using information platform, planning ahead, best-selling sales channels.

(3) Guiding farmers to change the consumer attitudes

The statistics on the number of early 1990s shows that the rate of agricultural post-harvest nature value and the ratio of logistics. Developed countries like United States is 3.8, Japan is 2.2, while China is only 0.38. In other words, the circulation of agricultural products in China is a course of mass decreasing and value reducing. For example, package, the start of produce, the origin of logistics, we must reject the idea of outmoded, explore new material, new technology. Just like this, we can protect the agricultural products for not be polluted, be decay, further enhance additional value.

(4) Strengthening cooperation with the third-part logistics company

The third-part logistics company plays a big role in the area of logistics, but there’s much shortcoming compare with mature market. At present, rural post logistics is the important component of rural logistics system, but has many problems such as post office is weak, the qualification of selling seeds and pesticides is not unified, business types and service offerings is rich enough. To look forward to two-win relationship, rural logistics market needs more third-part logistics companies to join.

(5) Promoting logistics technology standardization<sup>[5]</sup>

Standardization is a tool, a way of achieving logistics rationalization, as part of many logistics



system in rural areas, among both the connection and mutual restraint. The logistics costs and benefits have a major impact, must be uniform technical standards and job standards in order to coordinate, reduce friction, improve competitiveness of agricultural product. Specifically, we should reform the construction of logistics infrastructure in whole rural areas, should set up logistics information platform<sup>[4]</sup>, as much as possible to promote standardization of technology.

## 5 Conclusion

Henan's rural logistics market shows better development momentum in economic transition period, should explore sub-regional and phases optimal path based on market research. How to balance the integrate of persistence and stage, the overlap of progressive and radical, the interaction of government behavior and company action, the combine of regional and international, the differences between the individualisms of rural regions, still will obviously require further investigation.

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## Research on the Brand Upgrade of Embed Outsourcing System's Industry Cluster\*

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**Abstract:** Brand operation is in the highest value added link of the global outsourcing industry chain, so creating brand is the inevitable way to get rid of low level competition and form competition in the industry cluster, it is not only a important step to high-end the outsourcing industry chain, but also a key element of promoting the cluster upgrade. This paper firstly analyzes the necessity of upgrading industry cluster brand, then puts forward the collaborative brand upgrade mode based on the local enterprises and the industry cluster, and the local enterprise brand upgrade operation mechanism and industry cluster brand upgrade problems are also discussed on the basis of the above foundation.

**Key words:** International outsourcing; Industry cluster; Brand upgrade; Strategy

### 1 Introduction

Foreign articles about the research of industry cluster start from the study of the earliest “regional brand”, and gradually expanded to areas of industry cluster as the carrier of industry cluster brand research. The meaning of "regional brand" refers to collectively naming of public brand in a specific geographical in public brand, it is a national brand, local brand cover, geographical brand and cluster brand of the concept of many brand type.

In the year 2000, the Guang Dong province of China is the first creating the concept of “professional town”, professional town is the Guang Dong province of China economic development characteristic and advantage, it is the Guang Dong province of China “card”, it indicates the brand bud of the whole industry cluster. One year later, Beijing university professor and the research team WangJici in relevant industry cluster and its series research work, the first industrial cluster whole attention brand phenomenon, creatively puts forward “overall brand”, “regional brand”, "location brand concepts such as the term. The later years, the brand about industry cluster springs up and gradually develops, Zhe Jiang province of China and the government of Guang Dong province of China mainly of industry cluster of the construction of the most aggressive push brand in practice.

In this paper the industry cluster of embed outsourcing system is defined as follows: local industry cluster that relying on spontaneous economic powers of the industry cluster and endogenous driven at first by introducing foreign industry, specialization and resources in the optimization of the allocation of that drive to thrive local industry cluster, they formed competitive advantage with low cost and strong production ability, and the enterprise gathered with the main purpose to reduce production cost and transaction cost through specialization division of labor and cooperation, also share industry supporting, infrastructure and the labour market, and eventually process, assemble, OEM for multinational companies and foreign brand manufacturers. Such as China Zhe Jiang province of China, Fu Jian province of China, Guang Dong of China coastal area of textile clothing, shoes and hats, leather, house electric appliance, IT industry and so on.

Industry cluster brand is relying on the regional that has certain core business with competitive advantage and becomes the main source of some products, then gradually expands the influence scope, and finally forms the regional industry's popularity, reputation and strong market influence. Concerned our regional industry cluster of embed outsourcing system, despite more than 20 years of development and expansion, due to the double scope and control of the international big buyers or the multinational company in the developed countries, they still wander in the low end of the global value chain, and the brand value is not high, which becomes the main problem. Therefore, one of the effective option of promoting industry upgrade is to construct influential cluster brand, and promote the status of our embed outsourcing system's industry cluster.

### 2 Necessity of Brand Upgrade

First, the cluster brand upgrade is an important means and way of the industry cluster upgrade.

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After the formation of cluster brand, it will have a positive role in the produce of the famous brand enterprises, and the cluster brand is intangible asset owned together by the cluster enterprise and organization, and it will play a key role in driving the promoting of the cluster brand upgrade.

Second, cluster brand upgrade is the important link for industry cluster into the high-end value chain. The important means of the international competition is the brand competition, constructing brand with international standard , changing the simple processing, OEM production mode of the cluster, and creating conditions achieved by OEM to ODM and OBM change, this is the process of industry cluster upgrade process.

Third, cluster brand upgrade is an important source of getting market competitive advantage for the industry cluster. Like the enterprise or the product brand, the cluster brand is also based on cognitive a particular region of the purchaser product image and value dimension, it is the value provided for buyers by cluster products. So once established the cluster brand of wide popularity and reputation, that can be good to the product identification by buyers, and cluster brand products can expand the market depending on good brand recognition, so as to achieve the goal of the industry cluster upgrade.

### 3 Collaborative Mode of Brand Upgrade

The basic composition of cluster unit is enterprise, logically, enterprise upgrade is the premise of cluster upgrade, and the cluster upgrade happens after enterprise upgrade. And if the enterprise gets upgrade, that doesn't mean cluster must be able to get promoted, because of the cluster upgrade also influenced by other factors, such as industry, different characteristics of local policy, etc. Similarly, not any of the cluster enterprises has been upgraded can happen the cluster upgrade. Cluster upgrade itself is a dynamic process, the ideal situation is that the cluster ascension is took as a whole system and receiving directional, and each enterprise and unit corresponding ascension. Therefore, the combination of local enterprises and the industry cluster upgrade is the brand upgrade strategy of embed outsourcing system's industry cluster, the following figure 1 shows.

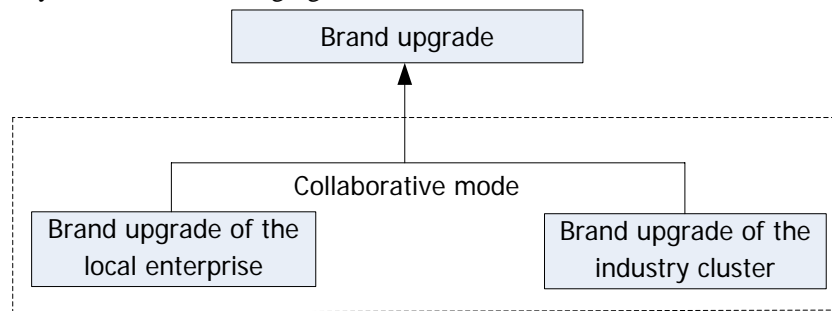


Figure 1 The Collaborative Mode of Brand Upgrade

The basic model of collaborative brand upgrade: one is the product brand rising to the cluster brand, that means firstly developing the well-known product brand, then through the product brand constructing the cluster brand; the other is to promote product brand after cluster brand, namely firstly through the regional economic management, planning, management, then improving the optimization of the industry development area environment, and finally to promote the regional economy development and shape cluster brand with good brand image of the industry. The strategy of cluster brand upgrade should base on the existing brand resources, foot on the international, technically support by the industry quality, raw materials management, production management, sales and service, image logo and the training of personnel comprehensive standard, treat the historical culture as the important content, optimize resources integration as the important means, choose the operation of the market as the basic pattern and overall promotion planning as the main promotion methods, also the unauthorized use and paid as the main way for trading, then create an international famous cluster comprehensive brand in the end. In addition, to do well in the trademark design and trademark registration work at home and abroad, and strive to promote and protect the whole image of the cluster brand, make best use of the resource allocation in optimization and cluster effect.

### 4 Operation Mechanism of the Local Enterprise Brand Upgrade

The high input and market turbulence of creating brand, bring high risk to the enterprise and brand activities, plus many enterprises, especially small and medium enterprises, have the common problem of

insufficient resources and capabilities, and individual enterprise is hard to take effectively brand activities. Therefore, the local enterprise can use the geographical position and industry association, through the resource sharing, complementary advantages and invest together and risks for collaborative brand, which can overcome the difficulties of insufficient resources and capabilities, but also spread risk, and make both parties achieve a "win-win".

#### **4.1 Brand guide mechanism**

In promoting local enterprise brand upgrade process, local government and related functional departments should correct the orientation, strengthen the guidance, outstand the service, strive for building famous brand and good environment for the enterprise. And for the enterprise with brand plan and the intent of brand, they should make a tracking management, move forward the services, grab from basic management, cut down from quality, regulate the enterprise internal management, solidify the enterprise brand foundation, establish enterprise brand platform, and promote enterprise's management quality and overall image, improve product quality and connotation market percentage of coverage, make the enterprise and the process of brand enterprise development ,expansion and connotation, ascend practice process of economic development in higher level.

#### **4.2 Brand learning mechanism**

Brand learning is mainly refers to the interactive process of the local enterprise who acquires knowledge, promotes the brand of technology, management and marketing ability with other brands and institutions .From the brand value chain perspective, the enterprise can effectively improve the product quality, improve brand awareness and reputation, create higher brand value in product supply, technical innovation and marketing synergy of strengthening the cooperation.

Brand learning mainly through two ways: one is the local enterprises study between each other in the regional industry cluster. It is an important way for small and medium-sized enterprises to promote the brand by imitation from other brand, they can quickly imitate another brand products, management, marketing methods, so formal learning between the local enterprises are particularly important for the brand upgrade. The other is a brand of learning in university research institutes of the industry cluster. As to the creation of knowledge, university research institutes are important in "bridge" role of promoting the complex relationship within a cluster of tacit knowledge transfer process.

#### **4.3 Brand knowledge spillover mechanism**

In the cluster internal brand study, the local enterprises and OBM international brands "participatory cooperation" contributes to global outsourcing of knowledge spillovers within the system, it produces spillover effect. In addition to formal learning outside, there still exists unique brand knowledge spillover of learning advantage inside a cluster. In the internal of the cluster, a large part of the enterprise knowledge spills out, and become public knowledge of the enterprises in the area of industry cluster. Brand knowledge spillovers within the enterprise include groups between overflow and group of university research institutions (including technology service center, the government research department, agency service agencies) to the group of enterprise in the spill. Brand knowledge spillovers through the following main ways: one is the cluster informal exchange. Informal exchange is an important way of tacit knowledge transfer, mainly through the two channels of social networks and the personal relationship network in the cluster. The other is a flow of enterprise employees. Employees with a certain skill will accelerate the flow in the cluster of the tacit knowledge transfer.

#### **4.4 Incentive mechanism**

Incentive mechanism is very important for local enterprise brand construction. First of all, the local government can motivate local enterprises in constructing and maintaining the brand upgrade investment behavior through the financial, tax and financial policies variables. Secondly, introduce the incentive mechanism of innovation for entrepreneurs. Because entrepreneurs with rich adventurous and innovative consciousness are generally the strong advocates of building brand, through the design of a risk and innovation of both the coefficient of incentive mechanism, it will promote entrepreneurs realize that once they take the lead in brand participation in the construction, it is possible to get a degree of first-mover advantages and get a high return, and have a strong development of innovation incentives for the entrepreneurs.

## **5 Countermeasures of the Industry Cluster Brand Upgrade**

### **5.1 Improve the awareness of the cluster brand**

Brand as "invisible hand", which has strong power and influence, can not only hold up a product, but also drive regional rapid economic development, and promote industry cluster upgrade. The success

experience of the cluster brand development shows that lacking of a strong product brand of cluster, there is no sustainable development impetus, no strong product brand of local cluster, and there may not be the real competitiveness. The cluster brand upgrade is not a single enterprise thing, especially needs the government to advocate and effective, sustainable boost. Therefore, the upgrade of cluster brand as regional economic important contents should be put into the agenda.

### **5.2 Improve the access mechanism of the cluster brand**

Access mechanism is the primary system guarantee of the effective operation for the regional industry cluster brand upgrade. The local government should fully communicate with the cluster enterprise, and industry associations, and other action of the main body, and establish strict access mechanism for the use of the brand cluster.

First, the enterprise is allowed to enter the cluster and be authorized to use appropriate cluster brand only after the product quality authentication and achieve the industry standard, so as to set a certain threshold to put out some bad qualification which may harm the brand image of the enterprise ruled. Second, the value of the cluster brand depends on effective regulatory and maintenance, and the product quality authentication and quality supervision is particularly important. In addition to general product quality authentication, a product authentication and origin fidelity authentication still should be noticed, for this is the basic means of the cluster brand. Finally, the property right of the brand cluster should be cleared, without the proper property protection system, access mechanism also cannot survive. Different from the individual enterprise brand, the ownership of the cluster brand is not obvious attributes, therefore, the problem of cluster brand owners can be solved through the government or industry association as regional cluster brand registrant, to the state administration for industry and commerce to apply for registration of a trademark, by registering cluster the brand trademark, clear the ownership of the property rights cluster brand.

### **5.3 Build good atmosphere for the cluster brand construction**

System innovation is the key of the cluster brand strategy. In the construction process of the cluster brand, the local government need provide support for the establishment and development of the condition for the cluster brand through the system innovation, concentration of necessary policy resources. One is to take the enterprise cluster development and cluster brands, as the breakthrough of transforming and build a good brand cultivation of the policy environment, market environment and the service environment. Second, it is to put the power of the relevant government departments and resources effectively to organize and promote the construction of cluster formation brand resultant force, because of the government departments involved more in the process of brand strategy. Third, it is to strengthen the government investment. Such as setting up the strategy of famous brand development fund, holding special funds that support cluster brand development, encouraging and guiding more enterprise actively to establish free brand. Making Efforts in the product positioning, function orientation and market positioning, driving the enterprise to develop in the market, increase investment on brand, and lay solid foundation for creating famous brand.

### **5.4 Cultivate cultural environment for the cluster brand construction**

The foundation of the enterprise is the local industry culture and entrepreneurial atmosphere, so great efforts should be made to build comfortable, free, open, just humanistic environment. The important standard of judging the cluster brand is that the region economic relations and social relations have highly inner relationship, namely enterprise in an area adjacent and nets, then produce the desire of the trust and cooperation. However, for a long time our country with a bad market mechanism, lack of social capital, low level of trust, highly transaction cost, all these make some areas in China and the enterprise only pay attention to use internal resources, and focus on improving enterprise within the adaptability and flexibility, and does not pay attention to seek enterprise external resources, thus it is difficult to develop effective cluster brand. Therefore, we should focus on cultivating area to create brand entrepreneurs and the system of the cultural atmosphere, in order to strengthen the enterprise culture construction and industry culture construction, and to cultivate honesty culture, collaborative culture and innovative culture, strengthen the ecological environment and management, perfect the social construction and management. Cracking down on fake behavior within the cluster, making sure that the technical innovation achievements, protecting their honest, forming orderly market and good innovation atmosphere.

## **6 Conclusion**

The cluster brand is a collective action of the integrated embodiment of many enterprises in the

regional cluster, it is a kind of public resource, which forming a higher industry or product profile reputation on a wide range of this region. For example, Paris perfume, Italy leather, Swiss watch, Hollywood movies in the United States, silicon valley in the IT products and Wen Zhou province of China lighters in our country, etc. The brand upgrade of the industry cluster can not only benefit to the improvement of the enterprise bargaining power, and develop domestic and international market, but also promote the whole area of the image, create favorable conditions for investment promotion and future development.

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## Study on Innovations in Advertising Language

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**Abstract:** As the most important carrier of information in advertisements, advertising language is the core of the advertising phenomenon. The paper aims to discuss the characteristics of advertising language and it generalizes the fundamental knowledge of the advertising including its definition, functions and characteristics of advertising language. Based on a corpus of 200 advertising English, the study makes an analytical study of innovations in advertising language at the lexical and syntactic levels from linguistic perspective.

**Key words:** Advertising language; Innovation; Characteristics; Linguistic perspective

### 1 Introduction

Penetrating into every aspect of consumption life, advertising has become one indispensable part of daily human life. Advertising is something that we are all exposed to everyday. It is something that is likely to affect us in a number of different spheres of our lives. Advertisement has become so common a social phenomenon in modern society that a French advertising critic once said that the air we live in was composed of hydrogen, oxygen and advertising.

Advertisements are presented with a type of language that is persuasive in nature, namely, advertising language. As the most important carrier of information in advertisements, advertising language is the core of the advertising phenomenon. Language has a powerful influence over people and their behavior, This is especially true in the field of advertising. "Advertising takes many forms, but in most of them language is of crucial importance." (Vestergaard and Schroder, 1985: Editor's preface by Peter Trudgill) Though visual content and design in advertising have very great impacts on consumers, it is language that helps people to identify a product and remember it, thus the choice of language to convey specific messages with the intention of influencing people is of prime importance in advertisements.

Because language serves as a major carrier of advertisements, the study of innovations in advertisements is, in most cases, the study of innovations of language in advertisements. Creative advertising language is an important part of innovation of advertisements and a decisive factor in the success of advertisements. The key to the realization of the advertisement effect is to provide people the promises of interest or the conception of consumption, but all these mainly rely on language. 50% to 70% of the advertising effect comes from its language. The wording of advertisements is especially crafted to meet the purpose of informing, persuading and influencing.

The large number of examples quoted in this paper is based on advertising material from British, American and Chinese publications at various times.

### 2 Innovation Creates Success

#### 2.1 Innovation and advertising

Innovation creates success and it is defined as the successful implementation of a creation (Heunks & Roos, 1992). Innovation is the introduction of new processes, new ways of doing things and revolutionizing how things have been accomplished previously.

The word "advertise" has its origin "advertere" in Latin, meaning "to inform somebody of something", or "to draw attention to something". The father of modern advertising, Albert Lasker defines advertising as "salesmanship in print". Media now encompass more than print with the advent of radio, television and internet. Nowadays Bovee's definition is widely quoted and it is accepted by the Definition Committee of American Marketing Association. It goes as follows: Advertising is the non-personal communication of information usually paid for and usually persuasive in nature about products, services or ideas by identified sponsors through the various media. (Bovee, 1992)

The ANNA (America National Association of Advertisement) sums up the purposes of advertising as: awareness, comprehension, conviction and action. What is advertising language? When defining advertising language, Geis states, "the language of advertising is aimed to affect people in many ways:

such as persuading or seducing people to purchase products or services, voting for particular political candidates and so on.”(Geis, 1994)The language is the most important part of advertising. The advertising language is almost brief and incisive in nature. It helps to make the advertisement more impressive and easier to remember. Featured with the value of memory and attention, successful advertising language meets the audience’s aesthetic criteria as well as social value. Advertising language has its distinguishing features in vocabulary, syntactic and rhetorical structures. It represents the images of the companies and spreads culture.

## 2.2 Impact of innovation and advertising on sales

Through innovation Coca-Cola transform into the world’s largest beverage company and a lead in market. In 1886, a carbonated soft drink Coca-Cola was born in Atlanta. 125 years later, it has been one of the world’s famous trademarks and more than 500 nonalcoholic beverage brands, primarily sparkling beverages but also a variety of still beverages such as waters, enhanced waters, juices and juice drinks, ready-to-drink teas and coffees, and energy and sports drinks sold in the stores, restaurants, and vending machines of more than 200 countries. Now, Coca-Col’s sales outlet has already achieved 87 percent in the world and the consumers enjoy 1.8 billion servings of Coca-Cola products daily. Muhtar Kent, Chairman of the Board of Directors and CEO of Coca-Cola company, convinced that their most important business breakthroughs will come at the intersection of sustainability and innovation.

Began with the first advertisement“Drink Coca--Cola”, it is said that the founder Dr. John Smith Pemberton grossed \$50 on Coca-Cola having spent \$73.96 on advertising; by 1872 advertising expenditures had reached \$ 1100; by 1920 they reached \$2 million. The research indicates that 82.2% of consumers for Coca-Cola brand cognitive is obtained through advertising. In 2007 Coca-Cola global advertising investment maintains nearly 20% of its global business income 24.088 billion dollars.

**Table 1 Company Shares of Soft Drinks (RTD) by Total Volume 2004-2008**

Company /% total rtd volume	2004	2005	2006	2007	2008
Coca-Cola China Ltd	12.3	13.4	13.8	14.5	14.8
Ting Hsin International Group	3.2	4.8	6.8	8.7	9.1
Hangzhou Wahaha Group	7.5	7.2	7.4	7.4	7.2
PepsiCo China Ltd	6.8	6.7	6.6	6.4	6.7

*Data source: Nielson report (updated toY08)*

Coca-Cola maintains high advertising investment compare with other soft drink brands. The undeniable fact is that the amount of advertisement and company shares of soft drink is directly proportional. The lower brand advertising contact leads to the decreased permeability of the brand. It can be clearly found: keep higher advertising contact rate is the key to success in the market. In the world, Coca-cola vied with Pepsi for more sales. If anyone of them wants to break balance, it should take some updates. In a formed market, innovation in product and advertisement is essential to any enterprises to possess positive market share, as all the products in this market are similar. Therefore, innovation in advertising is a key to make a breakthrough. The first one who makes innovations would be the one who owns more market share.

## 2.3 Innovation in advertisement

Advertising is any of various methods used by a company to increase the sales of its products or to promote a brand name. Innovation in advertisement is, kind of method, doing same things a new way, also productive compared to product innovation. It is the key determinant of success. Raymond Rubicam, once noted, “The only purpose of advertising is to sell. It has no other justification worth mentioning”. The function of advertising is to influence the purchase behavior of customers by providing a persuasive selling message about products and services.

This point can be illustrated with the example of Coca-Cola. In addition to its quality and taste, the advertising of the company has its specific characteristics and plays an important role in the marketing. The concept of innovation involves creating new things and bringing new ideas which are essential to the business success. Being best in business is just same as being innovative. All the key factors of innovation, product, service and business model, foster the growth of enterprises and stimulate productivity as well. With the awareness of importance of innovation, it has been consolidating its status as the business success.

From 1886 to 2011 Coca-Cola has created more than 60 advertisements which mainly utilize 11 rhetorical devices, including, pun, personification, oxymoron, etc. The figures of speech in Coca-Cola advertisements increase advertising effect and achieve good publicity effect, Such as:



- 1) Ice-cold sunshine. (1932, Oxymoron)
- 2) Where there's Coke there's hospitality. (1948, Parody)
- 3) Coke ... after Coke ... after Coke. (1966, Repetition)
- 4) Catch the Wave (for New Coke). (1986, Pun)
- 5) Coca-Cola Open Happiness (2011, personification)

Example (2) in the above is a parody which comes from the proverb "Where there's a will, there's a way". This advertisement, novel and unique, is easy to cause the audience's interest and associations. "Where there's Coke there's hospitality", shorten the distance between manufacturers, distributors and the consumers, achieve the expected effect of advertisement. It is the flexible use of rhetoric devices in Coca-Cola advertising that create the Coca-Cola unique brand. Therefore, the innovation of language in advertising plays a very important role.

### 3 Characteristics of Advertising Language

The innovation of language is the most efficient way to arouse consumers' curiosity and interest and attract them to purchase the products. The correlation between the novelty and the degree of spreading is a strongly positive one. Consumers are surrounded by advertisements in modern commercial society and in most cases, it is the visual content and design of advertisements that make the initial impact and cause them to take note of it.

When the advertising language of a product is full of novelty and easy to remember, it will be popular. Generally speaking advertising conducts the communication of information in three modes: audio, visual, and language. Comparatively advertising language in a way provides more exact, detailed and dependable information than music and pictures which act as supplementary means in advertising. Advertising language has developed its own features.

#### 3.1 Informative function

Three functions of advertising language--the informative function, the persuasive function and the reflective function are put forward by Vestergaard and Schronder in 1985. The informative function is absolutely vital in advertising. People will not buy products without information about them. Advertisements are successful or not depend on whether they persuade consumers to buy the product.

#### 3.2 Persuasive function

The basic purpose of advertising is to identify and differentiate one product from another in order to persuade consumers to buy that product in preference to another. Persuasive advertisements are thus the instruments used by the advertisers who "have defined their target audiences and determined the effect they hope to achieve through persuasive advertisements in the media"(Cook,1992). And a persuasive advertisement persuades the potential consumers to buy the product. The persuasive function is not only limited to attracting the potential consumers into buying a certain product, but also including the selling of services, values, ideas, and norms.

#### 3.3 Reflective function

As for the reflective function, advertising is not just a marketing tool but also a cultural exchange and a social actor. For these functions, the advertising language is of great importance.

It is undoubtedly true that advertising language is a kind of text that does its best to get the attention of the consumers, to make them turn towards it (Goddard,1998).

#### 3.4 Characteristics of advertising language

There are three distinct general characteristics, taken together, leading to advertising power:

Firstly, advertising language is purposeful. Advertising is a form of communication and language is the most important vehicle of communication. The purpose of advertising is to sell products or services. Therefore, advertising should tell its audiences the benefits of a product or a service, that is, the advertising should state, implicitly or explicitly, why the product or service is good for the consumers, why the consumers should buy it, or what the consumers can expect from it. In the case of advertising, space and time are costly, thus the wording is carefully crafted to meet particular ends in most cases.

Secondly, advertising language is rich and striking. In order to sell products or services, the first task of copywriters is to make their advertisements eye-catching. Once the audience's attention has been caught, the advertisement should hold consumers' attention and it should convince them that the subject of this particular advertisement is of interest to them. Furthermore, it ought to convince the consumers that the product will satisfy some need--or create a need which they have not felt before. The advertisement should convince them that the advertised brand has some qualities which make it superior to other similar brands. In order to achieve these goals, it is doubtless that advertising language should

be rich and striking. In addition, advertising language involves audience. Therefore, copywriters try to associate audience with the innovations of language which are efficient, pervasive and powerful. Advertising language is different from other languages because audience participates in it. The audience shares the knowledge about their total situation and their culture.

Last but not least, advertising language is a simple language. Copywriters cannot impress someone with their wide vocabulary in an advertisement and complex sentences will not encourage people to read the advertisement. People will also tend to believe advertising messages that are presented to them in simple words or expressions. When such words are used, audiences readily grasp the meaning without losing time in guessing. Many excellent advertisements are famous for their simple but powerful language, such as Marlboro, Coca-Cola, Nestle, etc. Difficult words are edited out and replaced by simple ones. With time passing by, advertising language has frequently changed. But these three distinct general characteristics have made it different from other languages. And they are taken together to lead advertising to its persuasive power.

#### 4 Innovative Strategies of Advertising Language

Advertising language, as the communicative vehicle of advertising, has its own specific linguistic features and functions. The structure, the content and the words used in an advertisement, all of them serve the purpose of attracting the potential consumers to purchase products or services.

Good advertisement should be unforgettable, competitive, novel, smart, compact and authentic. They endow active feelings for the brand and help people to distinguish the brand from others. With the purpose of drawing consumers' attention, advertisements are always designed to be special, outstanding and out of the ordinary.

Based on a corpus of 200 advertising English, the study makes an analytical study of the innovations in advertising language at the lexical and syntactic levels from linguistic perspective.

##### 4.1 Use of coinages for novelty

The creation of new and tricky words is necessarily the source of originality in advertising. Advertisements are always designed to be special and out of the ordinary. The use of coinages makes advertising languages special and unique. For example,

1) *We know eggsactly how to sell eggs.*

The word 'eggsactly' is wrongly spelt on purpose for 'exactly', making consumers take notice of it again. Some advertisements always say something deviant to arouse curiosity. New words or phrases created by means of imitation are occasionally seen. Such newly coined words and phrases suggest that the advertised product possesses peculiar qualities as well as the value of novelty, as in the yogurt advertisement below:

2) *First of all, because now Yoplait is thicker.*

*Second of all, because it's creamier.*

*Third of all, because it's still 100% natural and really very good for you.*

*Fourth of all, because to me Yoplait tastes better than all the Yogurts.*

*And fifth of all, because... well, just because...*

This advertisement of yogurt owes its success to the rhetorical devices and the particular creative style as well. The designer coined 'second of all... third of all... fourth of all... fifth of all' modeling on the set phrase 'first of all', and ellipsis is placed after 'because' following 'fifth of all', meaning the yogurt bears a quality that is so amazing, unable to be put in words.

3) *Drinka*

*Pinta*

*Milka*

*Day*

This is an advertisement for milk. In conformity with grammatical rules, the standard sentence should be "Drink a pint of Milk a Day". However, the word *of* is usually pronounced unaccented /f/, and the word *milk* has the capital consonant letter 'm' in this advertisement, causing *of* to be pronounced /ə/, which has the same sound with the letter *a*. Hence the article *a* here serves as a suffix of *Drink*, *Pint*, and *milk* to attain the sense of beauty in rhythm, thus arousing the consumers' curiosity and drawing their attention. It is crucial for advertisers to appeal to the audiences.

##### 4.2 Pun

Pun is one of the linguistic devices most frequently exploited to the end of novelty. A pun is a humorous play on words, sometimes on different senses of the same word and sometimes on the similar

sense or sound of different words.

4) *Ask for More--More cigarette*

The above is the advertisement for *More* cigarette in which *more* remind us of the double meanings of the word. The first *more* is the comparative form of the word *much* or *many* while the second is in fact a proper noun--the cigarette brand. The consumers are likely to be informed that *More* cigarette is good. If you smoke, you demand *more*.

In some cases it is advantageous to purposely choose a brand with a name that can be utilized in this fashion, especially if the product being advertised is difficult to distinguish from competitor products, much like the cigarettes in the above example. Puns involving brand names are very common in advertisements. It is a very effective means to achieve the ends to attractive the audience. The following are some advertisements with puns involving brand names:

- Be sharp.(Sharp AQUOS LCD)
- Right for everyone.(Pringles Right Crisps)
- I'd walk a mile for a Camel. (Camel Cigarettes)
- Better gas mileage. A Civic responsibility.(Honda Civic)

#### 4.3 Parallelism

Parallelism is a balance of two or more similar words, phrases or clauses. Known as parallel structure or parallel construction, it helps achieve emphasis and make the expression more rhythmical, forceful and passionate. Advertisers are very conscious of the importance of parallelism which makes the advertisement beautiful to listen to and easy to remember, thus tempting the consumers to buy their products. It frequently appears in the headline of an advertisement.

5) *A promise to respect your sense of style, most of the time.*

*A promise to provide for you, no matter what.*

This is the headline of the advertising offered by MassMutual life-insurance company. In this headline, the consecutive words *promise* appear twice representing honesty of the company, which is easily trusted.

Besides, parallelism in advertising saves space, which is used to list many other properties, normally with repetition of key words to put the product brand and its property together for the deep impression on consumers.

6) *Perfection in the wink of an eye*

*Perfection in its formula*

*Perfection in its brush*

*Perfection in a look*

This is an advertisement for EYELASH made by Christian Dior. In this advertisement, the same noun-phrases with word of *perfection* appear four times helping consumers to memorize the outstanding function of the eyelash product in one's eyelash's formula, brush and look, forming the perfection in the wink of an eye.

## 5 Conclusion

In brief, we should be fully aware of the importance of innovations of advertisement, in particular, the innovations of advertising language. The advertising language, cultural and psychological factors should be taken into consideration when we make advertisements. Only in this way can the good advertisements full of innovation be made.

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# Study on the Innovation Strength of Industrial Enterprises in Harbin City of China \*

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**Abstract:** The definition of innovation strength has two levels, it covers all factors directly related to technological inputs and outputs in the narrow sense, while in the broad sense, economic and social development driven by technology promotion is included additionally. Guided by the broad definition, this paper build an evaluation index system which is composed by four sub-modules, namely technology resource, technology input, technology diffusion and technology output. Based on this index system, a comparative study of technology innovation strength between Harbin and other vice-provincial cities is conducted with economic census data from 2005 to 2010. The results show that all 19th vice-provincial cities can be categorized into three levels in accordance with their entrepreneurial innovation strength, and Harbin is listed in the lowest category, although the innovation strength of most industries, especially manufacturing sector, have been improved in the past years. Verifying the driving forces of entrepreneurial innovation strength of Harbin, countermeasures have been put forwarded to promote innovation strength in the following aspects: promoting manufacturing sector, increasing investments, issuing preferential policy, improving awareness of patent preservation as well as speeding application of key and advanced technology.

**Key words:** Innovation strength; Industrial enterprises; Evaluation index systems; Index analysis

## 1 Introduction

Innovation strength actually is a dynamic and evaluative concept. Hence, there is no definition about it because it covers technology and the factors influencing technology, such as economy, society and culture. Nowadays, the definition is limited to the contribution and influence in military and economy of technology and its related activities. However, this definition does not have a good understanding of the power of technology. Braguinsky found that the innovation strength of one area should reflect its overall technical development state and level, especially the ability of technology application, and its potentiality<sup>[1]</sup>.

Malerba found that the definition of innovation strength has two different levels from narrow sense and broad sense. Narrowly speaking, innovation strength means the discovery, invention, and creation capacity reflected by the national or area technological resource investment and activities; while in a broad sense, innovation strength is the capacity to obtain output, promote social, overall economic development with the existing manpower, financial, knowledge and information resources in the productivity system of a certain nation or area<sup>[2]</sup>. Achilladelis's research shows that, in the narrow sense, innovation strength includes the directly related factors of technology inputs and outputs, while in the broad sense, it also includes the facilitation of technology for economy and society development in addition to the innovation strength in the narrow sense<sup>[3]</sup>. Since 1996, China's implementation of "Invigorating the Country Through Science and Education" strategy, the nation and all provinces have carried out a wide range of statistical monitoring of technological progress. Zhou Li and Wu Yuming's research shows that the national and provincial technologic progress evaluation index basically covers technological infrastructure, scientific and technological input, scientific and technological output, science and technology usage for economic and social development, which is similar to the study perspective of the innovation strength of the broad sense<sup>[4]</sup>. Thus, this report chooses the definition of the narrow sense to analyze the influencing factors deeply, detailedly, and comprehensively.

## 2 Data and Methodology

### 2.1 Factors influencing innovation strength

The current innovation strength constitutes technological potentiality; hence, innovation strength is a dynamic concept, and the evaluation of innovation strength should focus on its whole formation. The

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comprehensive and systematic evaluation mainly covers the following aspects: technological resource basis, technological input, diffusion and output. Technological resource basis refers to the necessary technological resource reservation for its long term continuous development; technological input refers to all the resources invested in technological activities including human resources and financial investment; technological diffusion is the bridge connected technological input and output, including technological introduction and diffusion; technological output refers to the direct output generated by technological activities and high-tech industrialization.

## 2.2 Identification of innovation strength evaluation system

The evaluation system is constituted of 4 first level index, 8 second level index and 24 third level index according to its definition and influencing factors(see Table 1).

**Table 1 Enterprise Innovation Strength Evaluation Index System**

First level index	Second level index	Third level index
Technological resource basis	Technological human resource	Number of professional people of 10000 people
		Number of people with college or higher education of 10000 people
		Number of engineers and scientists of 10000 employees
	Technological material condition	Funding of per capita for scientific activities
		Fixed assets of per capita
		Proportion of new fixed assets for research and comprehensive technique services
Technological input capacity	Technological manpower input	Number of R&D scientists and engineers of 10000 people
		Proportion of enterprise R&D personnel in the whole society R&D personnel
	Technological financial input	Proportion of R&D expenditure in GDP
		Proportion of R&D expenditure in technological input
		Proportion of local technological allocation in financial expenditure
		Proportion of enterprise R&D funds expenditure in products sale income
Technological diffusion capacity	Technology introduced capacity	Ratio of enterprise introduced technology assimilation
		Ratio of technology fee in the contract of introduced technology
	Technology diffusion ability	Technological achievement volume of transaction of per capita
		Ratio of technology transfer contract
Technological output capacity	Technological achievement	Number of 10000 R&D personnel technological paper
		The national science and technology achievement award coefficient
		Number of granted invention patent of 10000 employees
	High-tech industrialization	Proportion of hi-tech growth of overall industrial growth
		Proportion of hi-tech product export value of overall products export value
		Proportion of hi-tech new products sale income of product sale income
		Contribution of hi-tech enterprise growth to economic growth

## 3 Results

Firstly, collect the actual value of the vice-provincial and above cities according to the technological strength index that has been referred before (The absent data of 2004 economic census has referred 2002 R&D inventory data). Secondly, set the index of Beijing as 100, and calculate the index of other cities compared to Beijing, then sum all the single index and, calculate the average index, and finally, make the order of the technological comprehensive index according to the data (see Table 2). According to the order of the technological comprehensive strength, the innovation strength of the 19

cities can be classified to three matrixes.

**Table 2 Enterprise Innovation Strength of 19 Vice-Provincial and above Cities of China**

City of China	Index	City of China	Index
Beijing	100	Ningbo	25.4
Shanghai	96.8	Chongqing	23.8
Shenzhen	54.4	Xi'an	23.4
Guangzhou	49.5	Hangzhou	21.6
Nanjing	31.4	Shenyang	18.6
Qingdao	29	Harbin	13.6
Wuhan	27.4	Jinan	11.8
Tianjin	26.4	Xiamen	11.5
Chengdu	26.4	Dalian	9.4
		Changchun	8

### 3.1 The first matrix

The first matrix: Beijing, Shanghai, Shenzhen and Guangzhou.

The enterprise innovation strength comprehensive index of Beijing and Shanghai is 100 and 96.8 respectively, which is much higher than any other cities. Beijing is the largest technological center of China, and more personnel and funds are invested in enterprise technological activities; as for technological achievements, Beijing has the most invention patent, which shows that Beijing has the strongest enterprise independent innovation capacity; although the quantity of published technological paper is less than Guangzhou, it is still far more than other cities. Shanghai is the largest economic center, indexes of technological activities personnel, funding and applied patent rank the first in the list; however, the index of invention patents and published technological paper ranks the third, and has a large gap to Beijing, which is only half of Beijing. Hence, the technology strength index is 96.8, and ranks second.

Enterprise innovation strength comprehensive index of Shenzhen and Guangzhou is 54.4 and 49.5 respectively, which equals to half of Beijing and Shanghai, but far higher than other cities. Due to the reform and open policy and the location advantage, adjacent to Hong Kong, Shenzhen rise in China first. Although the power of scientific research institutions is relatively weak, it has a good innovation environment and mature market mechanism, which attracts the nations best talents and technological achievements. Meanwhile, Shenzhen puts many personnel and funds in technological activities, which made great achievements. Hence, the technology funds ranks the third and applied patents and invention patent ranks the second. Meanwhile, Guangzhou is also the pioneer of china's reform and opening, and its enterprise technology comprehensive strength ranks fourth. However, its published technology paper ranks the first, which shows that when create huge material wealth, Guangzhou has focused on theoretical research and creates a rich spiritual wealth.

Enterprise is the entity which directly creates material wealth. Generally, enterprise innovation strength is positively correlated with economic strength. In the first matrix, Beijing, Shanghai, Shenzhen, Guangzhou enterprise innovation strength rank 1, 2, 3, and 4, and their innovation strength matches their economic status.

### 3.2 The second matrix

The second matrix: Nanjing, Qingdao, Tianjin, Chengdu, Wuhan, Ningbo, Chongqing, Xi'an, Hangzhou, and Shenyang.

The enterprise innovation strength index of the 10 cities in the second matrix is between 18.6 and 31.4, which is 70 to 80 less than Beijing and Shanghai, and about 20 less than Shenzhen and Guangzhou, which is really a big gap; meanwhile, it is only 5 more than the fourth matrix, which is a quite small gap. The 10 cities in the second matrix all have their own characteristics in innovation strength. Nanjing has more enterprise technology activities personnel, and published paper, which ranks the fourth; Qingdao has more applied patents, which ranks the fourth; Wuhan has more technology funds and invention patents, which ranks the fifth and sixth respectively; index of Chengdu and Tianjin is very balanced; Xi'an has more enterprise technology activities personnel, and published paper, both of which ranks the fifth; and Shenyang has more invention patents, which ranks the fifth.

In the second matrix, Hangzhou phenomenon is special. Hangzhou enterprise technology comprehensive strength ranks 13th, which shows that it has a weaker technology strength. However, its

total GDP ranks the 7th, which shows that it has a stronger economic strength, and GDP of per capita ranks 5th, which means that it has a higher economic performance. To conclude, it is unusual for a city has a high economic performance and strong economic strength with a weak innovation strength. The innovation strength of Hangzhou mainly caused by its few enterprise technological activities personnel and funds, which ranks 14th and 12th respectively. However, Hangzhou has many technological achievements, applied patents and invention patents ranks the 8th and the 7th. With fewer personnel and funds, Hangzhou has created more achievements and economic benefits. China's reform and opening starts from the southeast coast to the inland gradually. The more foreign investment absorbed, the more foreign advanced technology transferred and the more quickly the economic grew. For example, in 2001, the foreign investment made use by Chinese cities are as following: Shanghai is \$7.41 billion, Shenzhen is \$3.60 billion, Guangzhou is \$3.603 billion, Tianjin is \$3.297 billion, Beijing is \$1.77 billion, Qingdao is \$598 million, and Dalian is \$1.48 billion. These cities have more foreign investments, hence their economic grow quickly with a high economic performance, and the GDP per capita ranks the top.

Hangzhou's foreign investment ranks the 14th, with only \$503 billion. Hangzhou's economic great-leap-forward development was achieved mainly by its enterprise reform deepening, enterprise mechanism innovation, and private economy development. The reason to analyze Hangzhou is not to say few technological investment and foreign investment is a good thing, but to say that economical development has different modes. The underdeveloped Midwestern cities should not only learn from Shenzhen's "export oriented" mode, to increase the strength of the opening, but also learn from Hangzhou's "technological skills" mode, to deepen reform and change mechanism.

### 3.3 The third matrix

The third matrix: Harbin, Jinan, Xiamen, Dalian, and Changchun.

The five cities in the third matrix has a weaker enterprise innovation strength, and the index is between 8 and 13.6, which is far less than other cities. Meanwhile, their overall economic strength is weaker, and their GDP ranks between twelfth and nineteenth. For Harbin, it is Chinese old industrial base, and it has faced equipment aging, mechanism rigidifying, and heavy burden under the reform and open policy, meanwhile, it did not pay attention to technological investment and innovation, all these has caused its low index.

## 4 The Innovation Strength Evaluation and Comparison of Different Industries in Harbin (2004-2008)

### 4.1 Innovation strength evaluation of different industries in Harbin (2004-2008)

Based on the economic census data of Harbin in 2005 and 2010, this part will make an evaluation and comparison of the innovative strength of enterprises in different industries. When index is calculated, it is on the basis of the index system on Table 1, but leaves out some data which are inappropriate for analysis according to different industries. The results of the calculation can be seen in Table 3.

**Table 3 Index of the Innovative Strength of Different Industries in Harbin**

Industries	Index of enterprises' innovation strength (2004)	Index of enterprises' innovation strength (2008)
Oil and natural gas exploitation industry	0.15	0.19
Ferrous metals mining and dressing	0.00	0.00
Non-ferrous metal mining and dressing	0.00	0.00
Nonmetal minerals mining and dressing	0.00	0.00
Other mining industries	0.00	0.00
Agricultural food processing industry	0.97	1.05
Food manufacturing	2.27	2.32
Beverage manufacturing	0.14	0.18
Tobacco products industry	0.45	0.52
Textile industry	0.18	0.25
Textile clothing, shoes and hats manufacturing	0.00	0.00
Leather, fur, and feathers (fine hair) and its products industry	0.00	0.00

Wood processing and wood, bamboo, cane, palm, straw products industry	0.00	0.00
Furniture manufacturing	0.19	0.21
Paper and paper products industry	0.00	0.00
Printing and the record medium reproduction	0.33	0.42
Cultural, educational and athletic product industry	0.00	0.00
Oil processing, coking and nuclear fuel processing industry	0.23	0.32
Chemical raw materials and chemical products manufacturing	0.37	0.42
Pharmaceuticals manufacturing industry	17.51	17.54
Chemical fiber industry	0.00	0.00
Rubber products industry	0.00	0.00
Plastic products industry	0.00	0.00
Nonmetallic mineral products industry	0.38	0.48
Ferrous metal smelting and rolling processing industry	0.88	0.93
Non-ferrous metal smelting and rolling processing industry	0.84	0.87
Metal product industry	2.38	2.42
General equipment manufacturing industry	1.94	1.95
Special equipment manufacturing industry	19.80	19.88
Transportation equipment manufacturing industry	2.35	2.43
Electrical apparatus and equipment manufacturing industry	28.41	28.46
Communication equipment, computer and other electronic equipment manufacturing industry	12.77	12.83
Instrumentation and machine building industry for culture and office use	1.63	1.70
Handicrafts and other manufacturing industries	7.14	7.18
Resources and materials recycle processing industry	0.18	0.25
The electric power and heat power production and supply industry	0.90	0.94
Gas production and supply industry	0.00	0.00
Water production and supply industry	0.22	0.29

#### 4.2 Innovation strength comparison of different industries in Harbin (2004-2008)

From Table 3, we can see that: firstly, the innovative strength of enterprises in Harbin has been increasing. From 2004 to 2008, all the industries has significantly improved their innovative strength except some which do not need much innovation in their technical development; secondly manufacturing industries own the strongest innovative strength among the enterprises in Harbin, especially electrical apparatus and equipment manufacturing industry (28.14), special equipment manufacturing industry (19.80), pharmaceuticals manufacturing industry (17.51), communication equipment, computer and other electronic equipment manufacturing industry (12.77) etc.. It shows the characteristic of industry structure in Harbin that equipment manufacturing industry is its pillar industry and has strong competition.

## 5 The Driving Forces for the Innovative Strength of Enterprises in Harbin

### 5.1 Opening to the outside world to participate in the globalization of economy and technology

The improvement of the innovative strength of enterprises in Harbin requires favorable objective and subjective factors. In the times of economic globalization and knowledge globalization, all the countries in Asia rise rapidly. Besides, political stability and rapid economic development and social progress in China now also provide an unprecedented period of strategic opportunities for the



improvement of the innovative strength of enterprises in Harbin. However, at the same time, the science and technology development model has to be changed from the traditional “self development” to the new “introduce development”, from “isolation” to “technology opening”, from “technonationalism” to “technology globalism”. Opening to the outside world is the main source of world technology innovation. Multi-channel and direct access to international advanced technology allows the enterprises to share the achievements of world science and technology revolution, therefore it is possible for them to realize the “technological catch-up”, so as to promote the “economic catchup”.

### **5.2 Enterprises and market-led development**

This factor turns the technological innovation activities from government-dominant model to market-dominant model and technological innovation subject from state-owned research institutions to enterprises in the competitive market. First, enterprises should become the subject of the investment in R&D. Then enterprises should also be the subject of the output of R&D. Finally, enterprises will become the subject of the needs of science and technology. Thus, the area innovation system with market as the subject will be formed.

### **5.3 Government’s guidance and promotion**

In a more and more competitive world, the innovation strength is the “mirror” of the competitiveness of an area. Most countries have introduced market economy, but only a few with significant state power can be really powerful in science and technology. The improvement of innovative strength of China is not only the result of market mechanism but also reflects that China, as a developing country, has a clear goal for national development and enough ability to realize the phased objectives. This is an unique and important advantage for science and technology development in China.

The government plays three important roles in the improvement of innovative strength of enterprises in Harbin. The first is to guide long-term development of science and technology, and gradually form strategic orientation mechanism. In a more open and increasingly competitive international environment, the government continuously puts forward phased strategic goals for the science and technology development, based on its trend in China and overseas, regional economic development and social progress.

The second is to create a good environment for science and technology innovation and gradually form incentive mechanism with supporting policies. A good economic and social environment includes safe investment environment, stable macro-economic environment, favorable environments for establishing business and for public opinion. This kind of environment is good for the growth and development of innovative and entrepreneur's spirits, good for the rapid spread and application of scientific and technological achievement, and good for international communication and cooperation in science and technology. To support scientific and technological development, government needs to make supporting policies involving finance, taxation, government procurement, international cooperation, talents team, intellectual property, conditions platform, etc. and thus directs scientific and technological power to the strategic orientation goals with incentive mechanism.

The third is to continuously offer more fund in research and development and form investment guidance mechanism. The investment in science and technology in Harbin has been increasing because investment in great technological activity directly promote the growth of strength in innovation of local enterprises. More importantly, it leads the whole society to invest in science and technology. Local government’s investment in science and technology will encourage enterprises to increase their investment.

### **5.4 Sustained and rapid economic growth in Harbin**

The sustained and rapid economic growth in Harbin is not only the demand side which will produce great technological demand but also the supply side which can offer great technological supply. The number of innovative patent application and GDP has a good index growth curve, which indicates the interaction between economic strength and innovative strength. Economic strength provides foundation for innovative strength and in turn innovative strength will continuously promote rapid growth of economy, therefore both strengths are enhanced by depending on and complementing each other.

## **6 Conclusion**

The existing researches show that the innovative strength of an area is related to levels of economic development. However, there is a large regional difference of innovative strength and economic development level in cities in China. The areas with strong innovative strength have a high level of

economic development, and vice versa, which means innovative strength plays a significant role in economic development. In other words, innovative strength is promoted rapidly in those areas which value technological development, so the level and speed of economic development are better than those in other areas. Therefore, if enterprises in Harbin want to promote their innovative strength rapidly, they have to develop science and technology by taking needs of economic development in Harbin into consideration, and develop economic rapidly with the help of science and technology. Based on the analysis above, specific measures are as follows:

The first, expanding electrical apparatus and equipment manufacturing industry, special equipment manufacturing industry and pharmaceuticals manufacturing industry. These industries in Harbin have great advantages in output, fund raised and expenditure of scientific and technological activities etc.. These traditional advantageous industries in Harbin are competitive in the market and the proportion of output value in GDP is gradually increased. In scientific and technological development plans, promotion of pharmaceuticals manufacturing industry should be clearly proposed with specific goals and supporting measures. Therefore, Harbin owns the foundation and strength to expand the above three industries.

The second, increasing the fund raised and expenditure of scientific and technological activities and appropriation expenditure of new product development. The fund raised and expenditure of scientific and technological activities in Harbin increase rapidly with 20% or more annual growth averagely. However, the speed is too slow compared with other big cities. Therefore, they need to be increased from multi-channels. The proportion of fund rose for scientific and technological activities in fund from enterprises, the government and loans of banking institution should be increased. The expenditure of equipment investment is increased rapidly, but when advanced equipment and technology are introduced in Harbin, enterprises need to strengthen their ability to absorb the advanced technology and create new product and technology of their own as soon as possible. A certain proportion of capital could be drawn from the income of new products as fund for other new products development to make sure funds for new product development can be increased rapidly and continuously.

The third, making more specific preferential policies to attract more and more talents to the high-tech industry. High-tech employees in Harbin increase slowly and the percentage of high level talents is lower than most sub-provincial cities. Though policies have been made to attract high level talents, it is still difficult to attract and keep them. One of the important reasons for this is lack of specific preferential policies. Policies which have been made are too macroscopical but lack of specific rules to make sure high level talents can enjoy the preferential policies. Therefore, the various kinds of preferential policies should be put into effect in order to attract more and more talents to the high technology industry.

The fourth, enhancing enterprises' patent protection awareness and turn them into subject of technological innovation. With the reform of scientific and technological system, enterprises become the subject of science and technology; most research institutions are engaged in research and market development directly facing the market; technological management system of institution of higher education gradually adapt themselves to market economy, so technological market gains more and more attention. In such circumstance, Harbin also proposes to build enterprises' technological innovation system in order to turn enterprises into the subject of innovation and to set up and perfect development institution. Enterprises is encouraged to cooperate with scientific research institutes, institutions of higher education, and even multinational company to build research and development institution in order to tackle key problems and research together. Thus, industrialization process is promoted. When applied research institutions change into technological enterprises or become part of enterprises or intermediary organization serving enterprises, they must enhance enterprises' patent protection awareness so that independent intellectual property rights can be protected and technology can be applied to new product soon.

The fifth, promoting key and advanced technology with commonness to make full use of effect of industrial cluster. Due to the commonness in areas of economic and social development, industrial cluster has been formed in Harbin. There is also some commonness in scientific and social development, such as weak R&D strength, lower patent output, less fund for new product development. The industries of electrical apparatus and equipment manufacturing, special equipment manufacturing, and pharmaceuticals manufacturing in Harbin have been developing fast and have strong competitiveness. Industrial cluster is becoming an effective way to promote Harbin's innovative strength and playing an important role in involving in industrial division, improving international competitiveness and promoting industrialization. Industrial cluster has gained worldwide recognition of government and

industrial circle for its leading and supporting roles. Knowledge and technology cluster are beneficial to interaction between disciplines and the transfer and distribution of technology, thus new breakthrough in high-tech and its industries can be made. Besides, regional technological cooperation enhancement and innovative system establishment are important parts of the regional innovation system under the national innovative system. To set up industrial technology and service system, mechanism and institutional environment should be formed for the integration and interaction of the innovative subjects such as enterprises, colleges and universities, research institutions and government, with the goal of improving regional innovative strength and the focus on trans-regional knowledge flow and distribution. Thus, the overall competitiveness of Harbin can be strengthened. By setting up the industrial technology center, platform and network, the industrial technology system is formed with enterprises as the subject to help with the breakthrough in enterprises' key technology. Therefore, to optimize resources of science and technology, to enhance regional technological cooperation and to strengthen technological competitiveness, Harbin should promote key and advanced technology with commonness to make full use of effects of industrial cluster.

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# Analysis of Interactive Relevance Between Manufacturing Industry and Service

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**Abstract:** The paper studies the interactive relevance of service and manufacturing industry and finds that it falls into four types, namely, parallel transfer model, supportive driving model, collaborative symbiosis model and industry integration model. The four models possess unique contents and features. The paper tries to predict the cooperation of service and manufacturing industry in the future based on relevance analysis.

**Key words:** Service; Manufacturing industry; Industry relevance model

## 1 Introduction

With the continuous development of world economy and the accelerated upgrading of science and technology, the service and the manufacturing industry gradually developed into a symbiotic stage with high relevance and complementary relationship from independent states as before. From only involved in the workshop, manufacturing industry gradually covers each links, such as market research, research and design, purchase and quality inspection, marketing management and after-sale service, etc. Meanwhile, through a long-time development, service fully turns into an intermediate supplying department from an independent economic activity that has nothing to do with physical product. Based on commodity economy system, it can support the technical progress, handicraft development, in-depth division of labor and management transformation. With the deepening interactive effect on both manufacturing industry and service, their relationship continues goes to strength and depth with a diversification trend appeared in their cooperation model.

## 2 Literature Review

Since the second half of 20th century, service which led by western developed countries has developed rapidly. The academic researches about service attract wide attention, especially on the relationship between service and manufacturing, one of the key research problems. On this point, the academia has many different views. But it can be summarized to four types: requirement compliance, supply-oriented, interacting theory, and reconciliation theory.

The requirement compliance theory considers that service is a kind of process-type industry<sup>[1]</sup>. It plays the role of glue in the economic activity, thus to drive the development of industry by stimulating the commodity production. The supply-oriented theory emphasizes that the effect and meaning of service to manufacturing industry. It considers that service is the premises and basis of boosting the productivity. Without developed service, it is hard to form a competitive manufacturing department. The interacting theory concerns that the productive innovation of manufacturing enterprises can lead the process innovation of producer service. And the producer service requirement causes the production innovation. These two are inseparable<sup>[2]</sup>. The reconciliation theory reflects the influence of modern information technology and economic globalization to industry competition and cooperation. In order to promote the competitiveness of manufacturing value chain, it starts to realize an infiltration in each link between producer service and manufacturing. The boundary between these two is gradually blurred and interacted<sup>[3]</sup>.

For the description about the relationship between service and manufacturing, the above four points are complementary and boosting instead of conflict. The requirement compliance theory and supply-oriented theory argue the influences between service and manufacturing from two different sides. And the differences of these influences are the ways of effect. However, the interacting theory concludes these two points. It is accordant with the current practical situation to discuss the interacting effect from the internal relation between the service and manufacturing. The reconciliation theory basically reveals the leading effect of the modern producer service led by information and knowledge to manufacturing and the tendency of constant interaction in the two industries. This point also reveals the future tendency of the two industries.

### 3 Interactive Relevance Model of Manufacturing Industry and Service

Based on the available views of scholars and the development history of the two major industries, the paper analyzes the four types of the manufacturing and the service industries linkage development from the their aspect of relevance, namely, parallel transfer relevance model, supportive driving relevance model, collaborative symbiosis relevance model and industry integration relevance model (as shown in Fig 1).

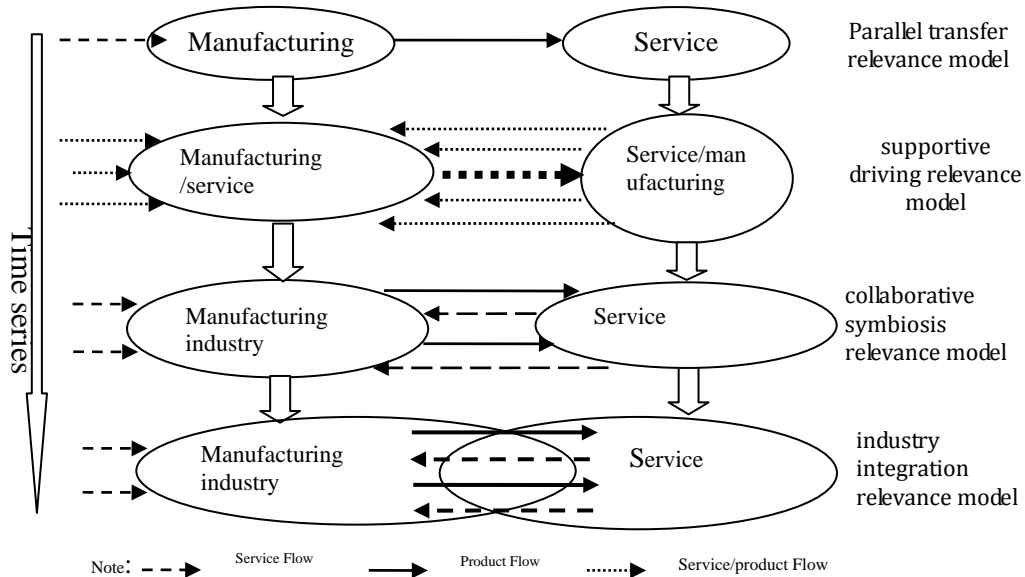


Figure 1 Analysis of Relevance and Interaction Level of Manufacturing Industry and Service

Among the four types, the first one emphasizes the weak implicative collaborative approach by which the two industries make the one-way transfer of resources based on the division of labor principle; while the second reflects the strong cooperation model of the two industries relied on the formation of principal and subordinate; the third place an extra emphasis on the two industries' equal and synchronization of the strong relevance interaction model; the last one, however, refines the comprehensive emerging industry with interoperability and harmony of these two industries on the basis of the third model, and harmonizes both industries' development with its strong industrial relevance. In the process of four rising models, relationship between manufacturing and service is continuously deepened, industry border is weakening and hidden, and finally form the type of industrial symbiosis which has the two industries' characteristics.

#### 3.1 Parallel transfer relevance model

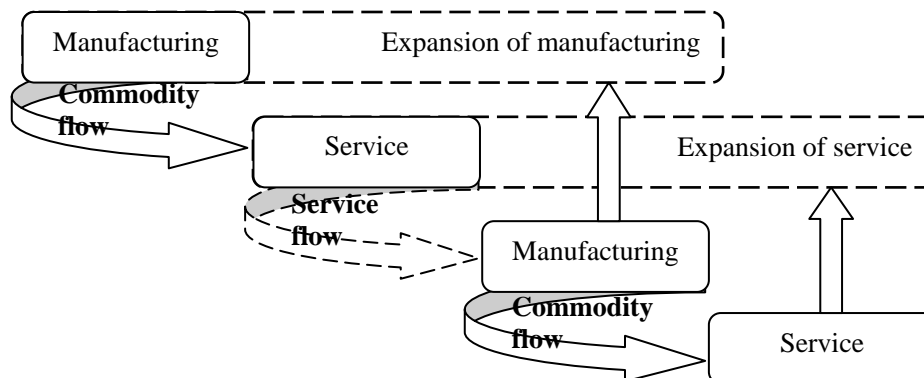


Figure 2 Parallel Transfer Relevance Model of Manufacturing Industry and Service

With the emerging and development of service, it's promoting function to economic development and the synergy function to those industries become increasingly obvious, the manufacturing and the service industries also gradually formed the interaction model which transform resources dividedly,

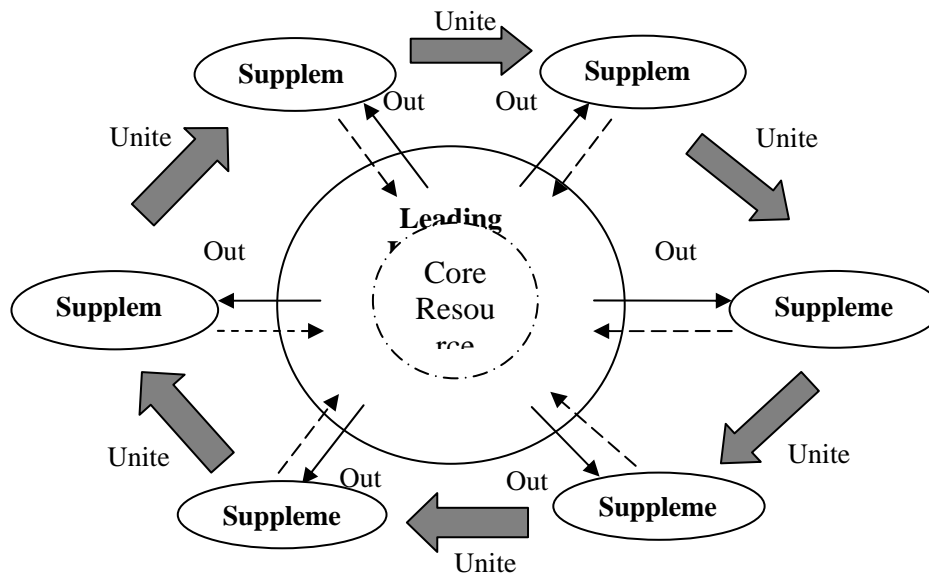
parallel transfer relevance mode thus comes into being in this background. With the division of labor on the basis of specialization, this mode relates the resources of service and manufacturing industry, makes the single path resources circulation to track through forward and backward, promotes industrial optimization and upgrading, thus expands the extending range of their industrial chains, and eventually realizes both industries' win-win developing mode (as shown in Fig. 2).

It is shown in this figure as well that service and manufacturing industry realize resource transfer and penetration by the cooperation model of unidirectional flow, which includes service flow and commodity flow based on the characteristics of division of labor in society, it meets the demand of industry as well as constantly extends new market demand to push the development of related industries, it also lays the foundation of the their deepened industrial relevance in the follow-up development.

**3.2 Supportive driving relevance model**

Supportive driving relevance model is put forward on the basis of "industrial centre theory" raised by scholars in domestic and overseas about the manufacturing and the service industries cooperation model. It symbolizes the two major industries to shift to the interaction of two-way resource transfer from the unilateral resources. In this theory, scholars have given two points, the "manufacturing center" and "services center". Both of them emphasize the master-slave relationship in such a model of cooperation. Based on the ideas, this paper summed up the supportive driving relevance model. The model emphasizes that in the process of cooperation between service and manufacturing industry, one of them is in a dominant position, it adsorbs auxiliary industries around to continuously conveying the required resources by the form of non-core resources outsourcing (as shown in Fig. 3).

Based upon this model, the leading industry gathers core resources inside, while the non-core ancillary resources are outsourced in the form of outsourcing to other industries so as to realize benefit-sharing and industry consolidation through strategic cooperation, resources in the optimization of the restructuring reenter the leading industry is conducive for leading industry to maximize its competitiveness in order to obtain a broader market space and longer-term prospects for the industry. And auxiliary industries, in the grasp of the leading industry's industrial outsourcing opportunities, in the completion of the established needs of the leading industry, will combine the resources of the leading industry output, integrate resources to focus on improving its own strength, so as to keep up with the leading industries of developing market capacity.



**Figure 3 Supportive Driving Relevance Model of Manufacturing Industry and Service**

**3.3 Collaborative symbiosis relevance model**

With the arrival of knowledge economy times, technology innovation and the renewal of thinking gradually become the priorities in each industry. On this point, the relation between the manufacturing industry, who leads the technology innovative revolution, and the service, who heads the innovation of thinking, is growing deeply connected. Their relationship transforms from primary-secondary

relationship to equal coexistent partnership. Considering the present demand of market, collaborative symbiosis relevance model becomes more and more popular, and continually expands its coverage and strength. Collaborative symbiosis model mainly refers to the fact that the manufacturing industry and the service would share the resources with equal interaction and then connect each other as a whole. By means of the collaborative integration strength with more featured products and industrial advantages, the industrial influence will stretch and expand, and the competitive edge should be maintained and promoted meanwhile (as shown in Fig. 4).

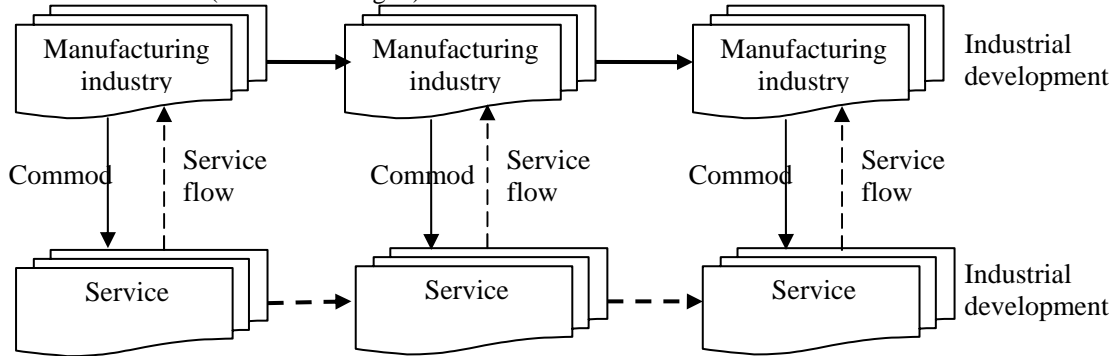


Figure 4 Collaborative Symbiosis Relevance Model of Service and Manufacturing Industry

As the figure shows, first a sharing platform for resource interaction and transformation between industries should be settled between manufacturing industry and service. By means of building a professional collaborative team or department, the important resource can be absorbed and integrated for the coordinated development of the two main industries. It is the preparation for better use of the follow-up resources. Once such resources are used in industries again, it can not only make up one's shortages through taking other industries' advantages, but also can stabilize and even expand its market share. Meanwhile, it also can introduce new resource to produce new features to the industry, thus to create a new profit point.

### 3.4 Industry integration relevance model

With the rapid development of high and new technology, which focuses on the information and the communication aspects, manufacturing and service industries are no longer clearly divided, but the degrees of infiltration and integration among those industries are getting deeper. Gradually, the coupling phenomenon is emerging between the two major industries. Currently there is a clear phenomenon of industrial convergence of manufacturing and service appearing among some industries, such as computer industry, telecommunications industry and the broadcasting and TV industry. Considering this integration relevance trend, the paper names it as an industry integration relevance model, which requires the manufacturing and the service industries, with high and new technology and concepts to form an integrated and symbiotic industrial unity, based on the mutual benefits and mutual trust principle. Through the production of integrated products, which should be featured by the characteristics of manufacturing and service, emerging market can be continuously excavated and explored. On the other hand, it also can support the relevance development of manufacturing and service (as shown in Fig. 5).

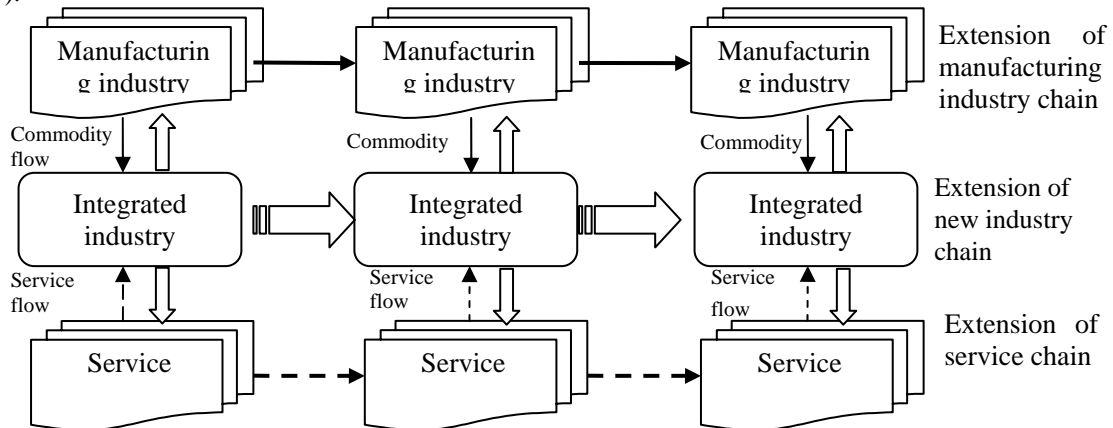


Figure 5 Industry Integration Relevance Model of Service and Manufacturing Industries

Under the guidance of this model, the core resource of manufacturing and service industries can be highly integrated, and the integrated resources featured by both of the industries are springing up too. It not only supports the emergence of new industries, but effectively adjusts the both major industries in the follow-up development. Thus, it can facilitate the industrial restructuring, optimization and upgrading. Meanwhile, when getting efficient information resource, the relevant industries will properly adjust the industrial chain to get relevant information as their support. Finally, the relevant industrial chains will be promoted into interactive developments.

## 4 Conclusion

With the continually compact relationship between the commodity and the service flows of both the manufacturing and the service industries, the rapidly developed scale of information, and the highly integrated information knowledge, invisibly shortens the gap between each industry. Their relationship gets closer, and cooperation is featured more dynamics. Apart from that, the integrative symbiotic relevant model of the two major industries is growing deeper, which will be reflected in the continuous renovation of traditional industries and the spring-up of new industries.

### 4.1 Traditional industry renovation

The renovation of traditional industry is mainly reflected in the speed-up introduction of service to traditional manufacturing industry, thus to stimulate the product updating and the industry upgrading. Currently, faced with the expanding demands in the market and the growing control power of economy, manufacturing industry can no longer satisfy the public alone. As a result, more manufacturing enterprises take service to promote the industrial vitality. For an instance, Ford Motor Co., whose primary service is no longer the production of motor vehicles alone, the rental car, the vehicle maintenance and other service businesses are the pillars of its economy as well. Through the combination of products and services, Ford attracts a lot of customers. Another example, General Electric Company, the traditional manufacturing enterprise in the past, now has an revenue from service businesses accounting for more than 40% of the same year's general income. It is obviously found that the edge of manufacturing industry and service is getting vague, while their interactive development is deepened.

### 4.2 New industry emergence

In order to satisfy the requirement of market for both the manufacturing and the service, entrepreneurs have to update and improve the old industrial model and management method. By means of innovative technology and management thought, they can promote the relevant industries developing in an order, thus to explore a sort of new industrial models. Therefore, the derived new industries, after resource recombination and upgrading, can not only satisfy the dual demands both from manufacturing market and service market, but also can accelerate their reaction speed to the transformation of public demands, thus to adapt to satisfy the marketing demands continually.

Based on the development history and relevant degree between service and manufacturing industry, the paper finds out four major interactive relevance models. It not only theoretically supports the research of interactive relevance between the two major industries, but also provides a certain reference when an appropriate cooperation model should be chose for the future development of Chinese manufacturing industry and the service.

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# Research on Integration Management of Government-Oriented Enterprise Restructuring\*

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**Abstract:** Government-oriented enterprise restructuring has its own specialty because it is an enterprise restructuring activity of government-oriented. On the basis of analysis the differences and similarities between government-oriented enterprise restructuring and market-oriented enterprise restructuring, this paper studies the main problems of government-oriented enterprise restructuring involved in the process of integration management. And then the main measures about government-oriented enterprise integration management have been proposed.

**Key word:** Enterprise restructuring; Government-oriented; Integration management

## 1 Introduction

Successful enterprise restructuring can improve the quality of the assets, optimize the allocation of resources, improve enterprise operating performance, and positively change the way enterprise develops. However, there will be many problems in the fusion process of both sides in the enterprise restructuring after enterprise restructuring. At this time, formulating a reasonable integration strategy to integrate the restructured enterprise is significant for the success of enterprise restructuring. Enterprise restructuring mainly divided into two kinds, the market-oriented and the government-oriented, this paper mainly focuses on researching the integration management of government-oriented enterprise restructuring.

## 2 Differences and Similarities Between Government-oriented Enterprise Restructuring and Market-oriented Enterprise Restructuring

According to different roles that government and market play in the process of enterprise restructuring, we divide state-owned enterprise restructuring into government-oriented and market-oriented. The common points of this two types of enterprise restructuring are that, the objects of this two types of enterprise restructuring are all enterprises, the effect of market is respected and brought into play in the process of this two types of enterprise restructuring, coordination problem between government and market is exist in the two types.

However, because of the different leadership, one is the government and another is market, in the process of the enterprise restructuring, these two types have significant differences between them in role playing of government, restructuring target selection, restructuring integration management and so on.

The leadership of the market-oriented enterprise restructuring is market, which plays a regulatory leading role in the restructuring activities. Therefore, the market-oriented enterprise restructuring, which motivated by internal pursuit based on the dissatisfaction of current situation in the process of development of the enterprise, is endogenous. The goal of enterprise restructuring is to enter the emerging industry which is growing up, or to obtain stable supplies of raw materials or product sales channels, or to gain financing ability in capital market through the back-door, or to reduce business risk through business diversification (Xu Jiangping, 2011). In short, the goal of market-oriented enterprise restructuring mainly reflects in strategic development, producing and operating, financial management, risk prevention, etc.

The leadership of the government-oriented enterprise restructuring is government, which plays leading and promoting roles in enterprise restructuring activities. Therefore, the starting point of the enterprise restructuring, which is the more the needs of macro economic development and the market regulation, the specific performance of external demand of enterprise development, a kind of gravity and pressure generated by the change of external environment, is exogenous. The motivations of government-oriented enterprise restructuring are: 1) the optimization and upgrade of the industrial structure. The enterprise restructuring eliminates backward productivity and technology, accelerates the use of high and new technology, encouraging and supporting strategic new industries; 2) to enhance the

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influence and control of state-owned economic on national economy development. The restructuring between state-owned enterprises, between the state-owned enterprise and private enterprise, between the state-owned enterprise and foreign enterprise, strengthens the state-owned economy; 3) to gain the right to speak on development of industries in the process of economic globalization. Through the state-owned enterprise restructuring activities, enterprises, especially the resources-based enterprises, improve industrial concentration and competition force and expand influence in international market (Henan province government, 2010). The three kinds of restructuring motivation, of which the exogenous feature is very outstanding, is more the needs of central government based on macro economic development.

### **3 Main Problems of Government-oriented Enterprise Restructuring in the Process of Integration Management**

Having the restructuring transaction completed, the enterprise, which steps into the phase of integration management, will launch the integration of business, culture, finance, human resources and management, with the enterprise strategy carried out and measures putted into effect (Xu Jiangping, 2002). In the current, the main problems government-oriented enterprise restructuring have met in the process integration:

#### **3.1 Link up integration strategy with enterprise development strategy**

Strategic integration is an important prerequisite for other integration activities. An accurate located general development strategy for enterprise can express the future development vision of the new enterprise exactly, depicts a clear development vision for the integration of new enterprise, and pointed out the direction of the integration management. Therefore, after eemerging one or several enterprises, the restructuring party must formulate an integration strategy which comply with the requirements of the enterprise overall strategy as soon as possible, making the assets, business and staffs of the restructured enterprise integrate into overall development track of new enterprise as soon as possible.

In general, there are three kinds of strategies to choose after government-oriented enterprise restructuring: 1) the vertical integration strategy, which makes the existing large enterprise in the industry as restructuring party, implements strategic restructuring forward and backward along the industry chain, and finally forms large enterprise or enterprise groups; 2) establishing strategic alliance. Enterprise positively develops strategic cooperation with similar enterprises, scientific research institutions, and trade units, upstream and downstream related enterprises inside and outside the region; 3) diversified development strategy. Under the support of government, the restructuring enterprise enters into local pillar industry or eemerging strategic industry (The state council, 2010).

Therefore, after determining the restructuring strategy, the new enterprise should focus the work on formulating integration strategy which accord with the actual of enterprise, to ensure that the requirements of the overall strategy can be implemented. However, there are two problems in the previous enterprises which have completed the integration transactions. 1) Deflected understanding of the strategic restructuring of the state-owned enterprise. Some executives regard the strategic restructuring work just as completing political task arranged by government, or simply interpreted as emerging more enterprise; 2) Insufficient attention payed to the integration management after strategic restructuring lead to the poor link between integration strategy and overall development strategy.

#### **3.2 Conflict from different enterprise values in culture restructuring**

The success of enterprise culture integration is directly related to the forming of strong cohesive force after enterprise restructuring, making rapid fusion and rising competitive advantage. At present, the strategic restructuring of state-owned enterprises are mainly developed between enterprises in the same industry. However, it also involves enterprises in different system of ownership, different management system, different scale and different region, after which it occurs very complicated phenomenon of cultural conflict performing obviously in enterprise values, management concept, management mode, inertial culture. Through comparison, enterprise culture conflict is particularly outstanding in the process of integration management after restructuring by introducing strategic investors, restructuring between state-owned enterprise and private enterprise crossing different system of ownership.

In recent years, the culture conflict, of which the intensity and adverse consequences are beyond the expectation of government, has happened many times in restructured enterprises. The most tragically heroic one is the restructuring between state-owned enterprise called tonghua iron and steel group and private enterprises called built dragon group in August 2009, because of not paying sufficient attention

to the huge enterprise value difference, the general manager sent by build dragon group to tonghua iron and steel group was beat to death by staffs and the restructuring activities was ended under strong intervention the government.

### **3.3 Problems of setting top managers and displacing identity of enterprise staffs in personal integration**

Top managers are superior resources of enterprise. In the integration of restructuring, how to set the former top managers of enterprise directly impact the psychological states and expectations of staffs especially restructured staffs in enterprise, and furthermore influence the restructuring identity of staffs. At present, state-owned enterprise strategic restructuring is mainly by the way of emerging small enterprises and medium-sized enterprises, or "incorporating" disadvantage enterprises. Restructuring enterprises are usually very mighty, that only retain extremely individuals of the top managers in restructured enterprises, making most executives especially middle managers in restructured enterprise laid-off. This part of fired managers suffers huge loss in general. In October 2005, as a project of "the eleventh five-year plan" combining with relocating ShouGang and adjusting the steel industry of TangShan, the JingTang integrated iron and steel Co., LTD which was registered in TangShan by ShouGang and TangShan iron and steel Co., LTD respectively accounting for 51% and 49% of the shares, might be expected. However, by the end of 2010, TangShan iron and steel Co., LTD decided to get out of the JingTang integrated iron and steel Co., LTD. One of the important reasons is that the "a hand" positions like general manager, minister, director of JingTang integrated iron and steel Co., LTD were assigned by ShouGang and the deputies were assigned by Tangsteel, what made the personnel integration difficult to reach the place(Deng Yao, 2011).

Another outstanding problem in restructuring enterprise personnel integration is displacing the identity of original enterprises' staffs. For historical reasons, the state-owned enterprises, especially small and medium-sized state-owned enterprises and the state-owned enterprises in bad condition, have huge debt in social insurance for the staffs. When the staffs once lose their state-owned identity, the new restructuring enterprise needs to completely assume the responsibility of repaying the historical debt, which makes the new enterprise difficult to accept; The sense of support and identity of staffs for enterprise restructuring will inevitably fall and the feeling of inconsistent will be produced without solving this problem.

### **3.4 Problem of reengineering organization of new enterprise**

Analysis from the strategic level, to realize the coordination effect of enterprise restructuring, we must make necessary adjustment for the organization structure of new enterprise. The process of the adjustment is long and complex and the task of it will be difficult. Mainly current problems in this aspect: 1) how to set up a normative governance structure for the new enterprise. That means to establish shareholders' meeting, the board of directors, the board of supervisors according to the requirements of the company law, and implement the system of appointing general manager by the board of directors, establish modern enterprise system as soon as possible, perfect the operation mechanism of new enterprise; 2) how to deal with internal control problem of border-crossing large enterprise. As large-scale enterprises, or even "No. 1" in their industries, restructured enterprises usually distribute in many administrative areas and internal control there may be weakened. At present, the new enterprises mainly reinforce the control to enterprises to be restructured by mastering the appointment of the senior executive, with little effort in level of system and operation mechanism. The third one is to prevent "big enterprise disease". Economic theory says, because of small pressure from external competition, mass levels of internal organization, large institutions, complex relationship, large enterprise formed by restructuring can lead to the reduction of internal resources using efficiency, there is a "X (not) efficiency" possibility, commonly known as "big enterprise disease".

## **4 The Main Measures to Improve the Government-Oriented Enterprise in Integration Management Performance**

The government-oriented state-owned enterprise strategic restructuring involves many industries, and the industrial characteristics are obviously different, so the specific measures of integration management will not completely the same. According to the analysis of the above common problems, the integration management of government-oriented state-owned enterprise strategic restructuring should take the following measures:

### **4.1 Pay attention to the processing of the property right relationship**

The processing of the property right relationship of the government-oriented state-owned enterprise

restructuring, is not only related to the vital interests of both restructuring parties, has also a direct impact on the interests of the local government. Therefore, before signing the restructuring agreement, it is necessary to understand the main body of property right of both sides and their restructuring relationship; after the restructuring agreement was signed, it is needed to speed up the standardization work for property right relations. If the new enterprise lacks clear standard property right relations, there can be no relationship management standardization, and the difficulty of the integration management will increase, then it is hard to make the new enterprise management be professional and scientific(Zhang Haizhong, 2009).

Considering state-owned enterprise restructuring wave in "the eleventh five-year plan" period is dominated by the government, and that involves the interests cutting of several administrative regions, province and city level have established the work units for enterprise strategic restructuring advancement, their main responsibility is to carry out investigation and research, policy measures, to coordinately solve great problems of the strategic restructuring. Looking from the current implementation, work efficiency is significant. However, on guiding integration management after the restructuring of the enterprise, this work agency is hard to play professional guiding function (such as assets evaluation, property transactions, legal guidance and services), the restructuring enterprise also need to pay attention to and play the role of professional intermediary institutions, to guarantee the processing of the property right relations to be accurate and exhausted, and to promote the integration management restructuring smoothly.

#### **4.2 Pay high attention to linking up the enterprise integration management strategy with the overall strategy**

The starting point of implementing the government-oriented state-owned enterprise restructuring may well be based on the consideration of the adjustment of development strategy, therefore, the realization of the strategic intent or not after the restructuring of the enterprise is one of the key factors to measure the success or failure of the restructuring activities. In the integration management stage, the enterprise must judges and analysis changes of professional characteristic, industrial competition environment, business philosophy, and management model based on the new way of thinking. At the same time of evaluating and revising strategic foresight and orientation, increase flexibility combining with the practical situation of the restructuring; At the same time, the restructuring enterprise must identify core resources and core ability of enterprise again, around the construction of core resources and core ability of enterprise, make integration management strategy in time, discover and correct the deviation between planning and implementation in process of strategic integration in time, to ensure the convergence between enterprise integrated management strategy and overall strategic and improve the efficiency of strategic management.

#### **4.3 Choose the right way into culture, effectively reduce the risk of the integration process**

In the government-oriented state-owned enterprise cultural integration, especially the restructuring of enterprises in the same original scale, market and level, which enterprise culture can rise for the mainstream culture, and by what kind of way to conform other enterprise, all these relate to the success of integration of new enterprises, have to choose carefully.

In the culture construction of government-oriented state-owned enterprise, the new enterprise often shows obvious exclusiveness and antagonism to foreign culture and cultural change. Therefore, the enterprise culture integration must choose corresponding integration mode according to the specific situation of enterprise restructuring strategy, enterprise culture type and degree of cultural differences, the different cultural need to integrate through the different mode. At present, the government-oriented state-owned enterprise strategic restructuring often use the absorption (or says spoon-feed) cultural integration mode, namely compulsively instill the culture of restructuring enterprises to the restructured enterprises, with little consideration on the acceptance and agreement degree of restructured enterprises, and little attention to positive and special culture of the restructured enterprise. In the short time, this way may form a kind of "unity" enterprise culture, and make restructuring integration activities looks peaceful on the surface, but is easy to produce accumulate conflict by repressing the restructured enterprise culture. Especially when the restructured enterprise is internally unity or has strong qualified but not to be recognized or used culture, it is easy to bring deep crisis lurk to the new enterprise behind the stable surface (Liu Wei, 2009).

#### **4.4 Establish and perfect the management control system**

In the government-oriented state-owned enterprise, restructuring of integrated management, establishing and perfecting the enterprise management control system is a top priority. Effective management control system construction, is not only for enterprise to improve the cost control ability,

lay the foundation of the risk control ability, also for enterprise to further optimize the industry structure, and realize the impetus to provide sustainable development of strategic objectives (Zhao Yujian, 2010). In the process of establishing a management control system, the starting point and the foothold of the enterprise is the new enterprise's overall development strategy. Under the guidance of the restructuring strategy, the new enterprise must first, according to the requirements of the science division, optimize various functions activities and enhance the cooperation level; the next, to choose the right management control mode. At present, in order to adapt to the enterprise scale and regional scattered need, a lot of restructuring of the enterprise chose the flat organization structure. This choice is appropriate. But the problem is that flat organization structure operation is the effective key to deal with the "centralization" and "decentralized" relationship. Enterprise management team should pay much attention to it; Again, to strengthen enterprise process comb. We must strengthen the business process comb, and pay more attention to the management process of the comb. At the same time, we should establish and perfect the system, standardize the enterprise and workers' behavior, for the implementation of the new process can provide system guarantee and increase the enterprise organization strength, improve the operation efficiency of the enterprise; on this basis, the control system will be built into the new core competitiveness of the enterprise.

#### **4.5 Solve placement problem based on business restructuring**

At present, one of the goals of carrying out the strategic restructuring in the government-oriented state-owned enterprises is to fully play their respective advantages of the industry, promote the optimization of the industrial structure and upgrade. Under this kind of request, the basic idea to carry on the business restructuring is: 1) the implementation of the business enterprise leading technical transformation and upgrade, improving the leading product manufacturing level; 2) to accelerate the auxiliary business detachment, and focus on using enterprise resources; 3) to strengthen the leading business marketing activities, such as to determine the dominant business brand, readjust marketing strategy, strengthen the marketing investment, etc.

The business restructuring will have two fatal shock to the original employees, one is for age, illness, and reducing reason by enterprise post who fired them into the unemployment line; the other is the technical unemployment, because mastery of the technology can not meet the new enterprise business development needs to back at work, also is the machine crowd out workers analysis of Marx phenomenon. If they also face the replacement identity, it will be added to the staff and workers of the enterprise. The fundamental way to solve this problem, is reflected not only in the new enterprise business restructuring speed and effectiveness, but also embodied in leading business development and growth. Because, the dominant business once determined, the resources will be configured in wider range and more effective use of platform, so as to realize the value of resource and the maximization of enterprise management benefit, because the society can create more employment opportunities, and job placement of the original employees should not be difficult to solve.

## **5 Conclusion**

To sum up, the government-oriented enterprise restructuring has its particularity. From the enterprise internal analysis, problems existing in restructuring management of the enterprise is still root in whether adopting the specific restructuring management measures, for example, in view of China's state-owned enterprise property status, the state-owned enterprise should attach great importance to straighten out the property right relations, even among the first question is, In addition, to speed up the strategic adjustment especially the formulation of restructuring strategy, choose the suitable way of enterprise actual cultural fusion, strengthen the management control system construction, focus resources to expand dominant business of enterprises, is also priority in enterprise integrated management. Only when increasing the implementation of these measures, can we accelerate the realization of the restructuring coordination effect.

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## Research on the Service Innovation and the Formation of Service Competitiveness

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**Abstract:** The goal of this paper is to analyze the constituent elements of service innovation, the connotation of services competitiveness, and the countermeasures and strategies for the Formation of services competitiveness. Firstly, we make an analysis about the service innovation, and present a four dimensional model to discuss the interrelationship between the four elements of service innovation. Secondly, we make an introduction of the connotation and relative research on services competitiveness. Finally, we put forward the strategic routes and corresponding suggestions for the Formation of services competitiveness in China.

**Key words:** Service innovation; Services competitiveness; Four dimensional model; Suggestions

### I Introduction

The process of economic globalization is speeding up gradually and has become the mainstream of world economic development. The global service industry developed rapidly driven by the knowledge, technology and the forces of globalization. The service industry occupies an increasingly important position in the economy of a country. It becomes an important criterion as a measure of a country's international competitiveness. The service industry play an important role for economic development, its essence is a modern service industry. There is important significance to accelerate the development of modern service industry for improving the quality and comprehensiveness of our country's economic competitiveness, industrial restructuring, change the mode of economic growth, alleviate employment pressures, improve living standards, cultivate new growth points and promote sound and fast economic development. Currently, the service sector gradually become the dominate part in economic activities, and the services market has become the strategic high ground in international economic competition. Since reform and opening, China has enhanced the basic position of agriculture industry and promoted the development of secondary industry, and also attaches great importance to the development of service industry. But with the international advanced level, the development of China's service sector is still lagging behind, the competitiveness of services need to be further improved.

### 2 Analysis on the Four Dimensional Model of Service Innovation

Just like any product, service innovation is seldom limited to a change in the characteristics of the service product itself. Mostly, innovation coincides with new patterns of product distribution, client interaction, quality control and assurance, etc. However, service innovations show huge differences in the kinds of patterns: what is important for introducing one new product onto the market might be totally irrelevant for other products. Offering a completely new service may differ considerably from offering an existing service using a new distribution channel. Similarly, some innovations are mainly the result of co-production of an innovator and his client while others are clearly the result of applying a certain technology.

Below, we will present four dimensions which we believe are helpful in describing and analyzing service innovations (see figure 1). This model is not statistically tested, but should be interpreted as tool to map and characterize various service innovations. The individual dimensions impact upon each other in both directions. Below we will present the four dimensions discerned.

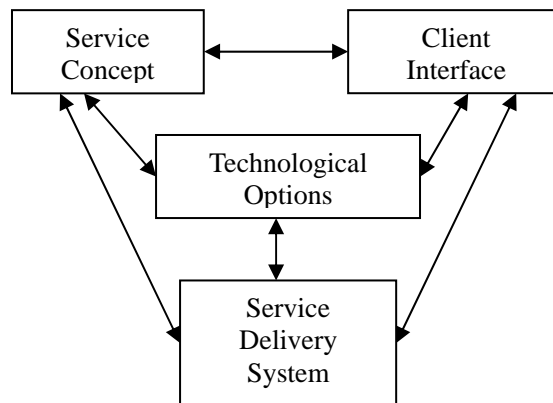


Figure 1 The Four Dimensional Model of Service Innovation

### 2.1 Dimension 1: the service concept

In manufacturing innovation, new products (and processes) are typically highly tangible and visible. This is often not the case with services. Some service innovations are highly visible, especially where delivery of the product is involved (ATMs, etc.). However, frequently it is not so much a physical product but a much more intangible characteristic of a new service, like a new idea or concept how to organize a solution to a problem. Although a particular service concept may already be familiar in other markets, the key thing is that it is novel in its application within a particular market. As usual in innovation research, there are thorny problems concerning when a product, function or concept is really new. Judgments can vary according to whether and when it is new to the providing firm, new to the client, to the regional, national or global market and whether it involves new logic or scientific knowledge. Although not all service innovations have such a strong conceptual element, conceptual innovations are much more likely to be found in service firms (or better service functions) than in pure manufacturing firms. Such innovations are usually highly intangible - meaning that while in some cases the service itself may have quite tangible elements, the new features are less to do with material artifacts, etc.

### 2.2 Dimension 2: the client interface

A second element of service innovations is the design of the interface between the service provider and its clients. These interfaces are the focus of a good deal of service innovations. Innovation studies with a focus on mass manufacturing usually tend to overlook in particular the changes occurring in these interfaces. Nonetheless, the communication between service suppliers and clients forms a major area for service innovation. As a quite general phenomenon across a wide span of services, product offerings are increasingly marketed and even produced in a client-specific way (even with client-specific pricing) and delivered electronically as far as they have informational components. In business services in particular, clients are often also part and parcel of the production of the service product. The way the service provider interacts with the client can be a source of innovation. Increasingly there is no clearly identifiable point where the producer's activity stops and the user's activity begins. This is of course particularly true where the business service itself is offering support for innovation, like e.g. in R&D and design services. With the high degree of co-design and co-production of service products, it may be difficult to locate the innovation within service supplier or client: it is not unusual, for instance, for service firms to site their staff within client organizations for periods of time.

### 2.3 Dimension 3: the service delivery system

The third dimension involving service delivery system and organization is often directly related to the previously discussed dimension referring to the linkage between the service provider and its client (the client interface). The delivery is one specific type of interaction across the client interface (others including financial transactions, design inputs, after sales, and so on). However, dimension 3 is different. It refers to the internal organizational arrangements that have to be managed to allow service workers to perform their job properly, and to develop and offer innovative services. It is closely related to the question of how to empower employees, to facilitate them so that they can perform their jobs and deliver service products adequately. On the one hand, new services may require new organizational forms, personal capabilities, and skills. On the other hand, an organization can be designed, and employees can be trained, so as to leave room for innovations and non-conventional solutions to practical problems.



#### **2.4 Dimension 4: technological options**

The fourth dimension is the centre of much analysis and debate, especially concerning the degree to which service firms themselves in practice are giving shape to technology development. Clearly, service innovation is possible without technological innovation; technology is not always a dimension. Nonetheless, in practice there is a wide range of relationships between technology and service innovation, varying from technology mainly playing a role as a facilitating or enabling factor, to something much closer to supply-push, technology-driven innovation. Service firms also differ in their awareness of relevant available technological options, the degree to which they dispose of the necessary technology themselves or have access to the necessary knowledge and the degree to which they consequently can act as demanding customers and articulate their technological needs. Many innovations are driven by downstream service sectors and can surely be considered user-dominated. In fact, users may play a crucial role in developing and implementing new services, although some of the required technologies may come from suppliers.

### **3 The Connotation of Services Competitiveness**

Industrial competitiveness is the ability for industry to access and to use of resources, and the level of a certain embodiment of integrated technology. From the current studies, the content of the service industry competitiveness is not much research as defined in the western academic competitiveness on services are services related to the competitiveness of the eight elements of the theory and the four stages of competitive services theory. The services competitiveness can be reflected from the eight elements. The four stage theory of services competitiveness divided the development of service industry into four stages based on service delivery aspects, namely the stage of providing services, stage of apprenticeship, stage of accessing to superior ability, and stage of supplying world-class service.

At different stages, the manifestation of services competitive is different. Domestic research is also rare, mainly Wang Xiaoping in its book "competitive service" make certain discussion. He thinks that the services sector includes both the service industries competitiveness and internal service enterprises competitiveness. The service enterprises competitiveness is the basis, and the competitiveness of service industry is the comprehensive competitiveness of service enterprises. Thus, the services competitiveness involved in service itself, many relevant aspects of relationships and behavior. The competitiveness of a region's service sector in the region reflects the comprehensive ability, in certain of its political, economic, technological, cultural, and human environment and conditions, relative to other regions has shown the capacity for viable and sustainable development. This service competitiveness studied in this paper is areas of industrial competitiveness. Industrial competitiveness is a country's specific industry through the sale of products in the international market as reflected in productivity.

### **4 The Countermeasures and Strategies for the Formation of Services Competitiveness**

#### **4.1 We should develop and improve the relative elements of services competitiveness**

The construction of international competitive advantage of service industry need to rely on knowledge, technology and other advanced production factors and professional factors of production more and more. Therefore, on the one hand, competitive strategy should be built on the advanced services elements of training and professional factors, and improve the service industry research and infrastructure investment. At present, the developed countries of the substantial increase in the services sector input into the services sector, average annual growth rate of R&D expenditures are rapidly growing in double digits. Our R&D investment is lower than the developed countries in the relevant way, and the gap becomes larger and larger. On the other hand, the state should provide adequate areas of basic research and research funding, increase scientific and technological achievements to market transformation, emphasis on education investment, increasing investment in education, R&D investment to develop education and training industries, and actively establish a scientific, a reasonable formation mechanism of high-level elements. We should improve its quality testing and monitoring mechanism, vigorously develop and introduce globalization talent for the development of service industry, and improve the quality of employees.

#### **4.2 We should actively optimize the industrial structure of service industry**

The overall international competitiveness of China's service sector is weak. Therefore, we should constitute the development plan of service industry based on the new situation of opening up and the

characteristics of the services development. We should give full play to the advantage of traditional service industries; focus limited resources to develop knowledge and technology-intensive service industries and new services to enhance the competitiveness. We should develop countermeasures for different regions, such as eastern region's economic development and good conditions for industrial development should focus on the development of information and knowledge-based high-tech knowledge-intensive modern services using service industry with international standards world standards continue to the end to international economic conditions. The scientific and technological capacity is relatively backward in central and western regions. The service industry, especially the modern service industry developed very slowly. We should combine the manufacturing industry and modern service industry together; improve the basic power of modern services industry.

#### **4.3 We should further enhance the market level of modern service industry**

Although competition in the industry by expanding the scale of change management and other ways to continue to grow and develop, but to enhance the brand value-based content-type development and alliances through a multi-format, cross-industry approach is complementary to the formation of healthy competitive environment of modern service industry, and thus enhance competitiveness in order to achieve a win-win objective effective way. Competitors can copy products, services, technologies and processes, but can not copy a great brand. An excellent long-term brand means competition. With the development of information society, each industry will face interaction between competition and cooperation, namely how to effectively solve the upstream and downstream supply chain, industry groups within the business relationship between competition and cooperation with each other. Modern service industry competition between the business and its essence is not only a value-creating process, but also both cooperation and competition between enterprises in the process. Therefore, China must implement a strategy for both competition and co-operate in order to reduce transaction cost and competitiveness cost, enhance the company's overall competitive strength.

#### **4.4 We should expand the opening up of modern service industry**

We should accelerate the development of services and implementation of the urbanization strategies, actively and steadily promote urbanization, rationalization of urban scale structure, and expand urban services consumer groups. Institutions should gradually speed up the process of outsourcing, changes in enterprises and institutions "large, small and complete" the organization, increase the intensity of government outsourcing services, public purchase of information management, research and consulting, business training, business etiquette, etc. services, accelerate the establishment of service characteristics consistent with the price formation mechanism and management system to distinguish between different clients, the establishment of classification fees regulatory mechanism. The banks should increase credit support for consumer products, to expand financial leasing, financial derivatives and other new formats logistics, and enhance the consumption capacity of residents and businesses. At the same time, we should make effective implementation of policies to enrich and increase disposable income, enhance the ability of residents in current consumption, system of annual leave for employees, encouraging tourism, stimulating consumption and enliven the holiday's consumer market and the night consumer market.

## **5 Conclusion**

The development of modern service industry has become increasingly important in the economy and is the key to promote industrial upgrading and embed the global value chains in developing countries. In the International service competitiveness level, China's service trade scale and international market shares significantly higher than in India, Brazil and Russia and other emerging economies. The advantage departments of service industry are mainly concentrated in the dominant sector in the traditional labor-intensive or resource-intensive industries, but the knowledge and technology-intensive services exports competitive advantage is not obvious or lack of competitiveness, these departments are the key markets deciding whether we can dominant international competition. Thus, in the coming period, China's service industry is not simply increasing the proportion of services in the economy, but how to maintain the traditional comparative advantage in services. At the same time, we have to optimize the internal structure of services to enhance the international status of trade in services and competitiveness, and accelerate the development of modern service industry through the deepening of service control system, relaxing market access initiatives.

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# Analysis and Application of Load Forecasting in the Urban Gas System Planning

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**Abstract:** Load forecasting is essential to the gas system planning and the operation scheduling with much economic benefit. Common methods and features of the load forecasting are summarized in this research. The load forecasting of the gas pipeline network plays an important role in managements of manufacturing, pipeline network, daily business, official information etc., and it is also an important access to the improvement of the security system.

**Key words:** Gas pipeline network; Gas system planning; Load forecasting of pipeline network; Forecasting methods

## 1 Introduction

To meet requirements of the global information technology, the Chinese gas industry has devoted to the enterprise information management since the 1990s. Due to the particularity of the gas industry, the security underlies the enterprises' survive in the market. The load forecasting, as an essential part of the gas enterprises, has received much attention with labor, resource and finance investments in recent years. With the construction of the "West-East Gas Transmission Project", "Digital Gas Supply", and "Security Construction of Society Information" etc., the load forecasting has become a significant subject in the gas system scheduling, the real-time control, the operation planning and the development project etc. How to improve the detection level of the pipeline network load and to establish a proper system for the operation planning as well as detection has been the chief task for the scheduling department and the planning department. This brings not only much economic benefit, but also good social benefit.

The load forecasting of the gas pipeline network mainly consists of two technologies, one is the forecasting technology of the future demand beforehand, and another is the forecasting technology of the future gas consumption afterward. In the load forecasting, properties of the system operation, compatibility strategies, natural conditions and social influences should be considered. Besides, by the analysis and study on the gas load values in history, the current and the future gas load values of the system are ascertained. The forecasting technology of the pipeline network load in China began in about the 1950s, and has achieved great success by the 1980s. The modern information technology, especially the computer technology improves the speed and the accuracy of the load forecasting. This research firstly puts forward some forecasting methods such as time series method, grey theory forecasting method, aggression analysis, expert system method and artificial neural network method; then analyzes and summarizes the working principles and the scheduling thoughts. In this way, we hope to have a discussion with the profession for a better improvement on the load forecasting<sup>[1]</sup>.

## 2 Methods and Features of the Load Forecasting of the Gas Pipeline Network

### 2.1 Time series method

The time series method utilizes the time to replace factors affecting the pipeline network load. By the statistical analysis with related load records, we made a curve quantization and evaluation to the past pipeline network load. Besides, a forecasting model for the pipeline network was established by some model designs and parameters. The time series method usually includes two parts, specific type and random type. According to the statistical analysis, we obtained the load parameters of the pipeline network at a future moment by corresponding models.

The specific type of the time series method usually includes the moving average method and the exponential smoothing method. The random type of the time series method usually includes the aggression model (AR (p)), moving average model (MA (q)) and aggression-moving average model (ARMA (p, q)) etc. Although the changing features, the changing trend and the development rules of the pipeline network load in a particular period can be deduced by the data that are arranged through the time sequence, uncertainty of the analysis results often occurs due to the influence on the time series from many factors. On the contrary, the random type of the time series method regards the time series as the random process, considering the uncertainty of the random factors comprehensively and offering

more valuable information. The typical representative is the ARMA model.

The mathematical model of ARMA is:

$$x_t = \theta_1 x_{t-1} + \theta_2 x_{t-2} + \dots + \theta_f x_{t-f} + e_f \quad (1)$$

$$x_f = (1 - w_1 B - w_2 B^2 - \dots - w_q B^q) e_f \quad (2)$$

$$x_i (1 - \theta_1 B - \theta_2 B^2 - \dots - \theta_p B^p) = (1 - w_1 B - w_2 B^2 - \dots - w_q B^q) e^i \quad (3)$$

Where:  $\theta_i (i = 1, 2, \dots, p)$ ,  $w_i (i = 1, 2, \dots, q)$  is the uncertain coefficient; the mean value  $e_f$  is the random disturbance whose variance is not zero;  $p$  and  $q$  are the order numbers;  $\{x_t\} (t = 1, 2, \dots, n)$  is the uncertain coefficient of the model;  $B$  is the retraction operator, and  $Bx_i = x_{i-1}$ ,  $B^i x_i = x_{i-i}$ .

Formula (1) is the AR ( $q$ ) model; formula (2) is the MA ( $q$ ) model and formula the ARMA ( $p, q$ ) model. These three models can make forecasting when the order and parameters of the models are ascertained. Since the changes of the gas load is a non-stationary random process with a certain increasing trend and periodicity, the difference operator should be defined to obtain a stationary random process<sup>[2]</sup>.

Meanwhile, the time series method also has some shortages:

- 1) Requirements for the data are high;
- 2) Expressing the nonlinear relation of loads by the linear model has some limitations;
- 3) Only feasible to the short term load forecasting in which the load changes are uniform; not sensitive to important factors that affect the load such as the weather changes; the management on the principle changes are weak; limited by the history data.

## 2.2 Grey theory forecasting

The grey forecasting technology based on the grey theory system is to make the systematical modeling of the factors that affect the load when the judging evidence is not enough. It is not a strict system method. Seen from the differential equations, the grey system model should make an exponential distribution of the original load data of the gas pipeline network, that is, the series should fulfill the exponential increasing requirements when the original data are accumulated. By doing this, the needed modeling sequence for the differential equation is obtained. The common grey theory model is the single variable one-order GM(1, 1) model; the differential equation is as following:

$$\frac{dx}{dt} = \alpha x - \mu \quad (4)$$

Features of the grey theory forecasting are as following:

- 1) The modeling is simple with few load data; efficient when the data is lacking;
- 2) No requirement for the changing trend and the distribution rules;
- 3) The calculation is simple, easy for detection, high accuracy for the short term forecasting. The grey theory forecasting can construct various forecasting models according to different features of the original data.<sup>[3]</sup>

By now, there is not yet a most common model in the concrete load forecasting technologies. Therefore, we should choose the proper improvement methods or combinations of the methods to improve the forecasting accuracy.

## 2.3 Aggression analysis

The aggression analysis firstly focuses on the correlation between the pipeline network load and the relative factors to study and analyze the changing rules of the history data; then finds the aggression equation of the independent variable and the dependent variable. Second, the aggression model is established through the aggression analysis, and the load records caused by the randomness are processed by the aggression analysis; then a curve record is obtained. Next, this curve is stretched to a certain future moment and the load forecasting value at this moment is yielded finally.

The aggression forecasting analysis usually includes the simple linear aggression model, the multiple-linear aggression model and the nonlinear aggression model etc.

The aggression forecasting model is:

$$q = f(x_1, x_2, \dots, x_p) \quad (5)$$

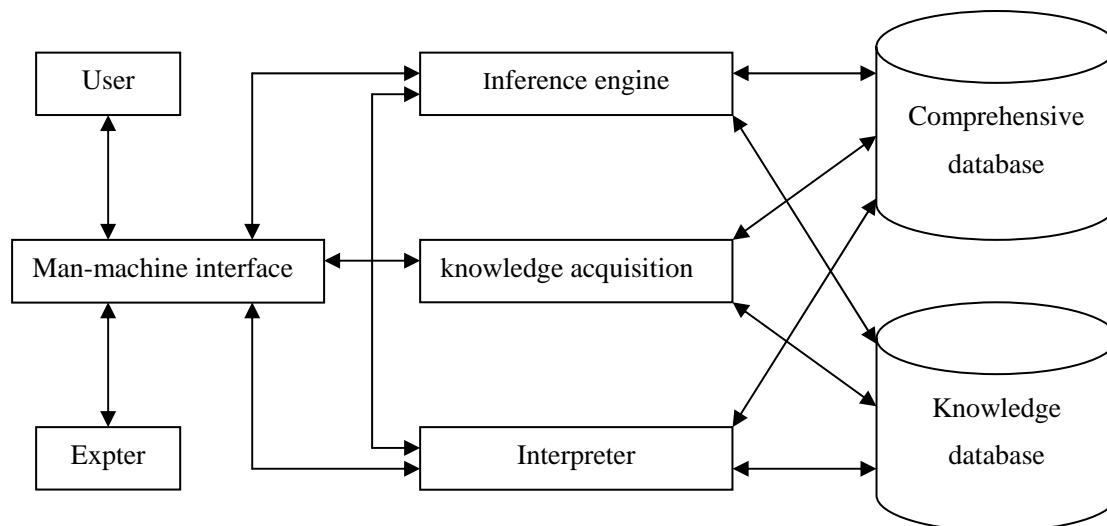
Where:  $q$  is the random variable, implying that there may be some specific and random variables in the independent variables  $x_1, x_2, \dots, x_p$ . The aggression relation  $f$  is either linear or nonlinear,

representing the correlations between the gas load and the main influencing factor. We can obtain the forecasting value of the gas load  $q$  by the future values of  $x_1, x_2, \dots, x_p$ .

The aggression analysis makes the selection and the forecasting accuracy of the independent variables as the calculation basis; it is a common causality-type forecasting model. As changes of the gas data are great and conditions are complex, this method is suitable for the long-term forecasting with a high forecasting accuracy.

**2.4 Expert System**

Expert system is to re-aggregate the experience and transform it to be a good result. According to the need of expert system, it's mainly composed of knowledge database, comprehensive database, inference engine, interpreter and knowledge acquisition, as shown in Figure 1.



**Figure 1 Expert System Structure Diagram**

Based on the data record for decades from database, expert system analyzes the gas pipeline load factors, especially compiles the forecasting results from the experts and authoritative organizations. In the predictions of gas pipeline load, expert system mainly solves various knowledge of gas pipeline load, including different mathematical models. Comprehensive database stores facts in the reasoning process and original data and generating information in the operation of the system, including meteorological data, the gas load and the data under the special circumstances in the past years, as well as the data with the forecasting results. Inference engine, controlling the reasoning process, will solve, revise, supply the data in the knowledge database and make the solving of the problems consistent and complete. The expert system can utilize the experts' judgment and decision-making skills to a maximum extent; meanwhile, it can get right theories and results by analysis of large datum and information; at last, it also can avoid the errors made by personal factors, so it is with more reference.

**2.5 Artificial Neural Network**

Artificial Neural Network (ANN) is a net system simulating human's behaviors and is connected by many neurons. It is an information processing tool which is different from other traditional calculation methods. It maps many complicated nonlinear relationships by the artificial neural network. It gets proper instant parameters by choosing and collecting weight and threshold value based on the certain models. In a short period of time, the pipeline load is in a process of stable randomness, so ANN is more feasible for the short term load testing. But for long term detection errors caused by political and economic factors, ANN has advantages of reference as following:

- 1) It can simulate human brain intelligence to deal with complex and varied data parameters;
- 2) It has the adaptive function by a lot of non-structured and non-accreted laws.
- 3) With the help of memory and self-learning of varied information, the features of knowledge reasoning and optimization calculation improve a lot.<sup>[4]</sup>

In the view of the excellent performance in some fields or systems, ANN can't be applied rigidly. If a good design and operation of ANN structure is applied directly to another system, the potential performance is not obvious, and even worse. Therefore, as for the specific rechecking detection, after

the long-term accumulation of original data and revision of models, it only confirms the relationship between the load and relative factors. By the study and comparison of artificial neural network, according to the load law in the special fields and special conditions, selecting different characteristic parameters, different data processing methods, different ANN models and structures makes the allowable range and gets satisfactory results.<sup>[5]</sup>

### 3 Analysis and Application of Various Forecasting Method

It is impossible to compare the above methods at the same level due to a variety of forecasting methods which differ in the research perspective, modeling method and applicable conditions. Therefore, we can take the comparison or analysis and application from five aspects.

#### 3.1 Research perspective and applicable conditions

In the description of statistical law of Time series method and Regression analysis, we find that they are more applicable in long-term and big-sample forecasting, while grey model method is more applicable in Gray system method showed by small package of statistics, and therefore it is more proper to use to analyze and forecast where it lacks information. Owing to many experts' knowledge and experience, expert system is more applicable in medium and long term Load forecasting. Being capable in learning, neural network method is proper in time series issue, especially in stably random forecasting.

#### 3.2 Statistical style

Time series method can directly forecast future value through the exponential weighting combination of the future value, in the process of forecasting, original statistics' modeling is adopted, such as Regression analysis is by statistics' collection and modeling, Grey system theory modeling by Generating sequence. Expert system method getting success on the basis of model set and various experiences and sense of judgment, neural network method by normalization of related factors.

#### 3.3 Calculating complexing degree

Regression analysis and Grey system theory are easier relatively and Regression analysis can be achieved by excel.

#### 3.4 Forecast the development of method

The time series method is applied most widely and maturely, while expert system method, Grey system theory and neural network method need further improvement.

#### 3.5 Length of applicable time

Time series method and Grey system theory and neural network method is appropriate in short-period forecasting, while Regression analysis and expert system method are proper in medium and long term Load forecasting.<sup>[6]</sup>

### 4 Conclusion

Gas Load forecasting has been a main factor to gain the modernization of the gas system management. Through the analysis and application comparison, we know that every forecasting method has its own advantages, disadvantages and applicable limits, so it is necessary to choose appropriate methods and models, according to actual conditions so as to get the accuracy within the permission of forecasting cost.

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# Inland Shipping Goods Externalities and Their Correction

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**Abstract:** Firstly this paper classifies inland shipping goods into three kinds: public goods, quasi-public goods and private goods. Then mathematical mode of externalities is established. Thirdly externality influences on externality bearer and producer are carefully analyzed respectively. Finally correction methods for positive and negative externalities of different shipping goods are put forward.

**Key words:** Inland; Shipping; Goods; Externality; Externalities; Correction; Efficiency

## 1 Introduction

The Inland shipping goods is a complex of public goods, quasi-public goods and private goods, the externalities of which influences heavily the characteristics of themselves and resource allocation efficiency. At present inland shipping is valued greatly for its ecofriendly, low cost and safety. Although there is much research on the externalities of common social good, research on that of inland shipping goods is rare.

In this paper, firstly inland shipping goods is carefully categorized. Then mathematical mode of externalities is established. Thirdly externality influences on externality bearer and producer are carefully analyzed respectively. Finally correction methods for externalities of different shipping goods are put forward.

## 2 Composition of Inland Shipping Goods

According to classification criterion of non-competitiveness and non-exclusiveness, all inland shipping goods could be categorized as three kinds: public goods, quasi-public goods and private goods. See Table 1.

**Table 1 Shipping Goods Classification**

Goods Category		Goods Name
Public goods		Fairway (including anchorage), Shiplock, Harbour navigation & safety facilities (Dock, Harbour basin, Inlet & outlet fairway, Revetment, Navigational facilities), before congested; Navigation mark (including signal station, indicator); Shipping control(Shipping administration, Safety control, Ship inspection, Customs supervision, Quarantine inspection etc.); Special shipping (used in salvage, emergency & war requisition),Fairway information service
quasi-public goods	Common resources	Congestion goods Fairway (including anchorage), Shiplock, Harbour navigation & safety facilities (Dock, Harbour basin, Inlet & outlet fairway, Revetment, Navigational facilities), before congested; Bridge hole
		Externality goods Salvage operation
	Club goods	Electronic chart; Pilotage
Private goods		Cargo operation facilities & service in harbor; Common shipping ;Shipping agency;finance & insurance;Information net

## 3 Essences of Externalities

Externalities refers to beneficial or harmful effects generated by the activities of an economic individual on the other and that the individual that produces the effects does not gain corresponding rewards or burden corresponding obligations, i.e. the variables contained in an economic individual's objective function, such as manufacturer's production function and cost function or consumer's utility function, are under the control of another economic individual. The essence of externalities could be described in a mathematical formula:

$$O_j = O_j(X_{1j}, X_{2j}, \dots, X_{nj}, X_{mk}), j \neq k \tag{1}$$

In formula (1), suppose  $j$  and  $k$  are different economic individuals. When the target function



$O_j$  of  $j$  depends not only on variables  $X_{ij}$  controlled by itself, but also on certain variable  $X_{mk}$  controlled not by itself, there exists the externalities that unit  $k$  brings to  $j$ .

If  $\frac{\partial O_j}{\partial X_{mk}} > 0$ , it shows  $k$  produces positive externalities to  $j$ . If  $\frac{\partial O_j}{\partial X_{mk}} = 0$ , it shows  $k$  does not produce externalities to  $j$ . If  $\frac{\partial O_j}{\partial X_{mk}} < 0$ , it shows  $k$  produces negative externalities to  $j$ .

## 4 Influence of Externalities on Resource Allocation

### 4.1 Influence on externality bearer

In formula (1), the budget constraint of  $j$  is:  $Y_j - \sum_{i=1}^n P_i X_{ij} \geq 0$ . Here,  $Y_j$  is the income of  $j$ ,  $P_i$  is the price of  $i$ . As  $j$  does not influence the level of  $X_{mk}$ ,  $X_{mk}$  does not appear in the budget constraint of  $j$  and the price of the result produced by  $X_{mk}$ , i.e.  $f(X_{mk})$ , is zero in effect.

Obviously, to realize utility maximization of  $j$  (i.e. Pareto optimality) under its budget constraint, the primary condition is goods marginal rate of substitution (RCS) between any two consumption activities is equal to the the price ratio of these two activities. As for any pair of consumption activities among  $X_{1j}, X_{2j}, \dots, X_{nj}$ , there is no problem to meet this condition, as the marginal utility of any of these activities, like the price of each activity, is a positive. But there is problem for RCS between any consumption activity  $X_{ij}$  and externality  $f(X_{mk})$ . As the marginal utility of  $X_{ij}$  is positive, but the marginal utility of  $f(X_{mk})$  could be positive or negative, and again  $P_i$  is positive, the optimal conditions meeting consumption efficiency is:

$$RCS\{X_{ij}, f(X_{mk})\} = \frac{P_i}{P_{f(X_{mk})}} \tag{2}$$

Formula (1) only holds when the price  $P_{f(X_{mk})}$  of  $f(X_{mk})$  to  $j$  is positive or negative. But as the price of  $f(X_{mk})$  is zero, the condition meeting efficiency maximization is destroyed, thus producing the low efficiency of resource allocation.

### 4.2 Influence on externality producer

Negative or positive externalities would cause excessive or insufficient production, which leads to social welfare loss. So for shipping goods which presents positive externalities, such as fairway, navigation mark, salvage operation and fairway information service, they are normally in undersupply state. But for shipping goods which sometimes presents positive externalities and sometimes presents negative externalities, such as shiplock, harbour, shipping and shipping control, they should be treated carefully: when they presents positive externalities, they are normally in undersupply state; when they presents negative externalities, they are normally in oversupply state.

#### 4.2.1 Negative externalities causing excessive production

See figure 1. At point E, MSB=MPC, but E is not the equilibrium point meeting efficiency requirements, as supply line S represents only private marginal costs and does not count in external marginal cost (MEC). So the line actually reflecting social marginal cost (MSC) should be line S', which intersects with demand line D at equilibrium point E'. And E' decides the equilibrium price P' and equilibrium output Q', which meets resource allocation efficiency requirements. Obviously P < P', Q > Q', which shows that negative externalities make actual production quantity bigger than production quantity meeting Pareto standards and causes excessive production, which leads to net social welfare loss ΔEFE'.

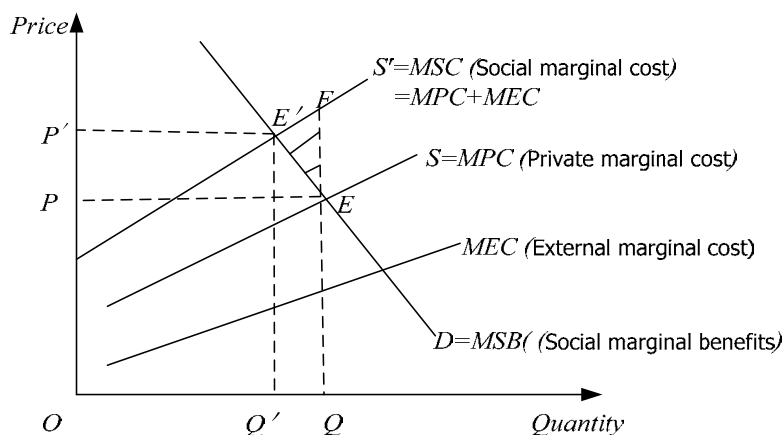


Figure 1 Negative Externalities And Excessive Production

4.2.2 Positive externalities causing insufficient production

See figure 2. Point  $E (P, Q)$  intersecting by supply line  $S$  and demand line  $D$  is not equilibrium point meeting resource allocation efficiency requirements as line  $D$  reflects only private marginal benefits ( $MPB$ ) and does not take count in external marginal benefits ( $MEB$ ). Point  $E' (P', Q')$  intersecting by supply line  $S$  and demand line  $D'$  (social marginal benefit) is the equilibrium point meeting resource allocation efficiency requirements. Obviously  $P > P'$ ,  $Q < Q'$ , which shows that positive externalities make actual production quantity smaller than production quantity meeting Pareto standards and causes insufficient production, which leads to net social welfare loss  $\Delta EFE'$ .

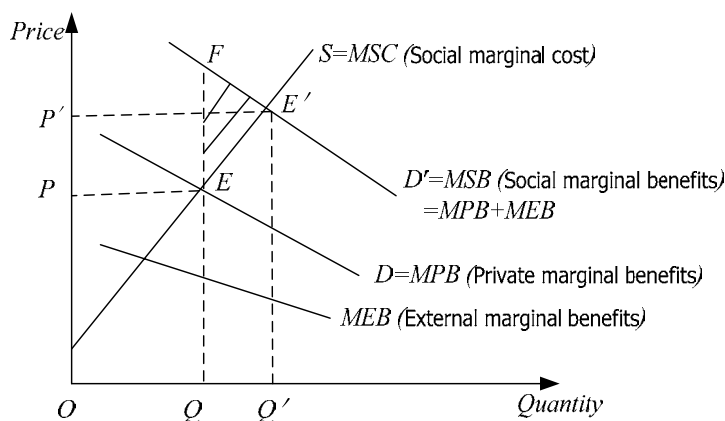


Figure 2 Positive Externality And Insufficient Production

Some shipping goods' external benefits may decrease with the increase of shipping goods quantity, such as fairway information service. The more the quantity of fairway information and vessels that can receive that information, the less the improvement room for traffic safety and smooth. When the quantity of fairway information and vessels that can receive information reach a specific level, the external marginal benefits will be close to zero.

In addition, a special condition should be pay attention to. As shown in figure 3, before production quantity reaches point  $Q$ , with the existence of external marginal benefits ( $MEB$ ), there are two demand lines, namely  $MPB$  and  $MSB$ . With decreasing of  $MEB$ , distance between the two demand lines will be more and smaller, and finally  $MEB$  reaches zero at point  $B$ , when the two demand lines intersect together. If supply line is  $S_1$ , as there exists  $MEB$ , positive externalities will make resources allocation in a distorted state. When supply line  $S_1$  moves to  $S_2$ , as  $MEB$  is zero, social marginal benefit and social marginal cost reaches equal, consequently externalities disappearing.

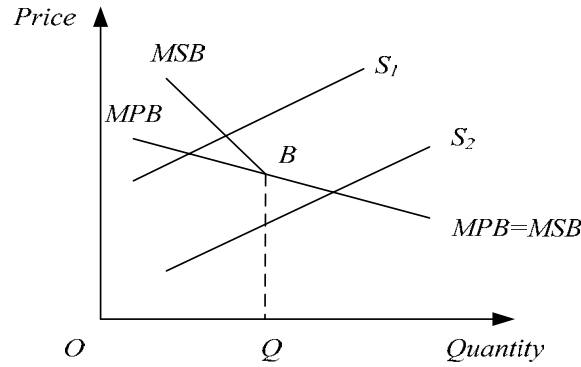


Figure 3 MEB Decreasing and Externalities Disappearing

4.3 Externalities contents and correction methods

As the externalities of each inland shipping goods are different, it is necessary to adopt different single or combined method adaptive to their characteristics to eliminate or ease externalities. And even for the same kind of method, the using degree and contents for different shipping goods should be carefully be decided to achieve the best resource allocation efficiency. See Table 2.

Table 2 Externality Contents and Correction Methods of Shipping Goods

Goods Name	Externality Contents	Externality Correction Methods
Fairway	Mainly positive externalities: green transportation, agriculture irrigation, flood discharging and water adjustment, industrial cluster, environment beautification, land value-added	Positive externalities: financial subsidies
Navigation Mark	Mainly positive externalities: water safety, visual enjoyment	Positive externalities: financial subsidies
Shiplock	Positive externality: fairway continuity Negative externality: shipping congestion & blocked	Positive & negative externalities: property right demarcation, organization integration
Harbour	Positive externality: public service, land value-added, easing pressure of other transportation modes, regional economic development Negative externalities: environment pollution, ecological destruction, traffic congestion, traffic accidents, river bank occupation	Positive externalities: financial subsidies, organization integration Negative externalities: moral restraint, taxation, policy and regulation control and pollution emission trading system
Shipping	Positive externalities (but not obvious): producers and consumers' surplus, consumption pattern change, life space development, specialization of production and land use, the growth of the economy size, optimization of economic structure, technical progress Negative externalities: environment pollution, ecological destruction, traffic congestion, traffic accidents	Positive externalities: financial subsidies, organization Negative externalities: moral restraint, taxation, policy and regulation control, pollution emission trading system
Shipping Control	Mainly system externalities, that is, bringing vice externalities to victims, and bringing positive externalities to beneficiaries.	Positive externalities: policy and regulation control Negative externalities: moral restraint, policy and regulation control
Salvage Operation	Mainly positive externalities: shipping unblocked and safety A few negative externalities: navigation obstruction when in construction	Positive externalities: financial subsidies Negative externalities: moral restraint, policy and regulation control
Fairway Information Service	Mainly positive externalities: navigation efficiency and safety	Positive externalities: financial subsidies

## 5 Conclusion

The Inland shipping goods is a complex of private goods, public goods and quasi-public goods. Their externalities always make them in a sub-efficiency resource allocation state: excessive production caused by negative externalities and insufficient production caused by positive externalities. Correction for externalities is essentially the adjustment of the goods' private marginal costs or private marginal benefits to be consistent with its social marginal cost or social marginal gains. The correction methods could be through market mechanism, government intervention, or the combination of them, each of which has different advantages and disadvantages and should be used separately or jointly with appropriate degree and contents to maximize the resources allocation efficiency.

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# An Analysis on the Differences of CPI among All Provinces and Cities in China: Based on the Analysis of Cross-Sectional Data<sup>\*</sup>

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**Abstract:** As the influence of the "double festival", China's consumer price index(CPI) increased 4.5 percent in January 2012. Price term still in high, not only affect the healthy development of the national economy ,but also affect the normal life of residents, especially the low-income groups, therefore, continue to control prices rising too fast remains a tremendous task. In this paper, the principal component analysis (PCA) method is applied to analyze the data of China's monthly CPI by Category of 2011 among the country's 31 provinces. Three components are selected according to the PCA result, and then all provinces by the score of component are sorted on and the scores of different regions for comparison are observed. At the end, the 31 provinces are classified into 5 categories by using hierarchical cluster method. After the above research, some counter measures for inflation-controlling will be put forward.

**Key words:** CPI; Inflation; Principal component analysis; Hierarchical clustering analysis

## 1 Introduction

The latest data published by the National Bureau of Statistics shows that China's consumer price index(CPI) increased 4.5 percent in January ,2012. Among it: food rose 10.5%, wine and cigarette, gone up 3.7%, while clothing, family facilities and maintenance service , medical care and personal items, traffic and communication, entertainment and education and inhabitancy increased 3.3% ,2.6%,2.6%,0.2%,0.7% and 1.9% respectively.



Figure 1 The CPI Tendency Chart from September of 2009 to March of 2011

CPI is often used to measure the inflation degree or life cost level. Generally speaking, when CPI > 3% ,the inflation forms. While When CPI > 5%, we call it the serious inflation.

In terms of low-income people, their wage growth rate is not able to catch up with the speed of inflation when it's short-term inflation. The faster the speed of inflation is , the quicker the actual income will decline .Whether in China or other countries, decision-making departments particularly concerned about that rising inflation may lead to social instability. Controlling prices remains a tremendous task.

## 2 Relevant literature Review

In recent years, the CPI is always the focus of scholars at home and abroad, concerning the compilation of the CPI index, trend forecasting model and empirical analysis on the factors of effect on the CPI.

### 2.1 CPI compilation problems

<sup>\*</sup> This paper is supported by Education Single Project at the Foundation of the National Social Science of "research on the central region new generation farmer human resource capacity construction (GrantNo.BKA100098)". This paper is the substantive result

Gao Xu (2008) is a combination of macro and micro-economic level, system analysis of the CPI in that price statistics standards<sup>[1]</sup>. Xu Dilong, Xie Min (2008) will be our country of CPI international comparison, put forward to the CPI from consumption of classification, the survey method, own housing treatments suggestion for improvement<sup>[2]</sup>. Gao Yanyun (2009) to the CPI published in international comparison calls on improving the transparency of statistical data<sup>[3]</sup>. Xu Qiyuan (2010) starting from the CPI data and subjective differences, CPI data accuracy question raised much debate<sup>[4]</sup>.

At present, our country used to calculate the CPI goods and services project, by the state statistics bureau and local statistical departments determine classification. National Bureau of statistics according to the country's 120,000 household sample survey on the unified urban and rural households' consumption expenditures determine the categories of goods and services, setting the food, tobacco, alcohol, and supplies, clothing, household equipment products and services, health care and personal products, transport and communications, entertainment, education and cultural products and services, eight categories of residence 262 basic classification, covers all consumption of urban and rural residents.

### 2.2 changes in the CPI trend prediction model

Liu Zhenwei (2009) using ARMA model of our country in 1996 to 2007 annual average CPI for empirical analysis, establishment of prediction model, draw of our country economy will be resumed in 2010, also faces inflation risk<sup>[5]</sup>. Zhou Ruifang (2008) based on the CPI characteristics of time series data, by comparing the Autoregressive model of the CPI and one to three order ARCH model parameters, be CPI short-term prediction of the optimal first-order ARCH models to Autoregressive model<sup>[6]</sup>. Zhang Yuanzhang and Wang Shumin (2010) on the consumer price index and retail price index of commodities in Henan province, the agricultural production index, industrial price indices and indices of prices of raw materials, fuel and power purchased fixed assets investment price indices and Multivariate regression model building, analyze the model goodness to be high which can be used for prediction of CPI in Henan province<sup>[7]</sup>. Ren Xiaotao, Teng chun and Liu Da (2010) through the introduction of hidden Markov models to analyze the fluctuation of CPI, came to the CPI forecast value and probability distributions<sup>[8]</sup>.

### 2.3 CPI empirical analysis of influence factors

Zhu Li (2007) using grey correlation analysis method to analysis of the food price index in China and which is related to the price of goods, and in the extent to which the effects of CPI rose shows rising food prices will not lead to overall inflation's outbreaks<sup>[9]</sup>. Tan Benyan and Liu Jianping (2009) according to January 2001 to April CPI basket of eight categories in the consumer price index of the classification monthly data, using test Association whole system medium-and long-term drive power and short-term drive force method, from CPI classification index Angle to prove our country with structural CPI fluctuations, food, transportation and communication and entertainment education cultural goods and services 3 classification index is also influence short-term fluctuations and long wave factors<sup>[10]</sup>.

Liu Haibing, and Liu Li (2009) in the VAR (Vector auto-regression) model based on using impulse response functions and variance decomposition method of empirical analysis of influencing factors of the CPI, come to the money supply, fixed asset investment scale and effect on the CPI of the ex-factory price of industrial products significantly<sup>[11]</sup>. Xia Yulian and Zeng Fusheng (2010) using the above method examines the relationship between CPI and prices of major agricultural products, that fluctuations in the prices of major agricultural products is unlikely to impact on the CPI<sup>[12]</sup>.

### 2.4 Other related research

Zhou Qingjie(2008) from the Angle of economics qualitative analysis the self-owned housing in the CPI processing<sup>[13]</sup>. Wang Shuangzheng (2010) based on 2003-2008 31 provincial-level Panel data model for panel data, analysis of economic growth in different regions, urban residents income differences and the relationship between the CPI and the ex-factory price of industrial products<sup>[14]</sup>.

## 3 Methodology

Most of the studies on CPI at home and abroad are about setting up time series analysis models according to the time series data.

This article divides the CPI evaluation indexes into eight categories based on the purposes of the investigated contents, including food, alcohol and tobacco, clothing, family facilities and maintenance service, medical care and personal items, traffic and communication, entertainment and education and

inhabitancy.

In this paper, the data of China’s monthly CPI by Category of 2011 among the country's 31 provinces is collected and the principal component analysis (PCA) method is applied to analyze the panel data. Three components are selected according to the PCA result, and then sort on all provinces by the score of component and observe the scores of different regions for comparison. At the end, we use hierarchical cluster method to classify the 31 provinces into 5 categories. By the above research, some counter measures for inflation-controlling will be put forward.

**4 The selection and preprocessing of the variable data**

This paper collects the data of China’s monthly CPI by Category of 2011 among the country's 31 provinces from national statistical database(<http://219.235.129.58/welcome.do>), then the monthly data is reduced to the annual data. Using the eight categories of CPI as variables and 31 provinces as sample, we carried out analyses.

Different indexes have different dimensions. In order to eliminate variables differences in the order of magnitude and enhance the comparability between data, data should be standardized. Excel can be used to carry out the standardization of original data. As follows:

$$Z - X_i = \frac{X_i - \bar{X}_i}{\sqrt{D(X_i)}} \quad (i = 1, 2, 3, \dots, 20) \tag{1}$$

Among them,  $X_i$  is original observation.  $\bar{X}_i$  is the mean value of initial data at position i.  $D(X_i)$  is the variance of initial data at position i. After standardization, the standard deviation of new variables become one and the mean values become zero.

**5 Analysis**

In order to understand the status of China’s CPI in 2011 more fully, the data of China’s monthly CPI by Category of 2011 among the country's 31 provinces will be analyzed quantitatively by using principal component analysis and hierarchical clustering analysis.

The principal component analysis (PCA) method is applied to analyze the original data by using the statistical software of SPSS and the total variance explained (as table 1) and the component matrix (as table 2) are output.

**Table 1 Total Variance Explained**

Component	Initial eigenvalues			Extraction sums of squared loading		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	2.068	25.852	25.852	2.068	25.852	25.852
2	1.723	21.540	47.391	1.723	21.540	47.391
3	1.158	14.469	61.860	1.158	14.469	61.860
4	.933	11.658	73.517			
5	.896	11.201	84.720			
6	.580	7.245	91.965			
7	.330	4.119	96.084			
8	.313	3.916	100.000			

According to the principle of determining the number of principal component, that is the number of eigenvalues greater than 1, determine to extract three principal components.

**Table 2 Component Matrix**

	Component		
	1	2	3
X1	-.742	-.275	.339
X2	-.297	.329	-.397
X3	.459	.495	.383
X4	.245	.793	.249
X5	.647	-.167	.433
X6	.338	-.397	.180
X7	.494	-.687	-.058
X8	.618	.088	-.673

According to the component matrix,eigenvectors can be computed(as the following table):

**Table 3 Matrix of Eigenvectors**

	Z1	Z2	Z3
X1	-.52	-.21	.32
X2	-.21	.25	-.37
X3	.32	.38	.36
X4	.17	.60	.23
X5	.45	-.13	.40
X6	.24	-.30	.17
X7	.34	-.52	-.05
X8	.43	.07	-.63

According to the above table,the expression of principle components can be written down,as follows:

$$F_1 = -0.52X_1 - 0.21X_2 + 0.32X_3 + 0.17X_4 + 0.45X_5 + 0.24X_6 + 0.34X_7 + 0.43X_8$$

$$F_2 = -0.21X_1 + 0.25X_2 + 0.38X_3 + 0.6X_4 - 0.13X_5 - 0.3X_6 - 0.52X_7 + 0.07X_8$$

$$F_3 = 0.32X_1 - 0.37X_2 + 0.36X_3 + 0.23X_4 + 0.4X_5 + 0.17X_6 - 0.05X_7 - 0.63X_8$$

The computational formula of comprehensive score of Y is as listed below:

$$Y = \frac{\lambda_1 Y_1 + \lambda_2 Y_2 + \lambda_3 Y_3}{\lambda_1 + \lambda_2 + \lambda_3} \tag{2}$$

The total score calculation and ranking is as following table:

**Table 4 Scores and Ranking**

	F1	F2	F3	F	ranking
1 Beijing	2.33	1.33	-0.71	1.43	2
2 Tianjin	-1.57	3.20	-0.86	0.07	17
3 Hebei	-0.54	-0.19	-1.38	-0.59	24
4 Shanxi	-0.12	-0.63	0.62	-0.14	18
5 InnerMongolia	-1.67	-1.26	-0.11	-1.24	29
6 Liaoning	0.28	0.70	-0.21	0.32	12
7 Jilin	0.76	0.25	0.16	0.49	9
8 Heilongjiang	-0.95	0.81	-0.64	-0.34	22
9 Shanghai	1.58	3.39	1.92	2.22	1
10 Jiangsu	0.14	1.39	0.70	0.64	7
11 Zhejiang	0.62	0.60	1.12	0.71	5
12 Anhui	-0.40	0.85	0.59	0.18	14
13 Fujian	0.30	0.11	-0.18	0.15	15



14 Jiangxi	0.47	-0.19	0.71	0.31	13
15 Shandong	-0.60	-0.16	-1.57	-0.65	25
16 Henan	0.25	-0.26	-1.15	-0.18	20
17 Hubei	1.05	0.69	0.15	0.76	4
18 Hunan	1.21	-1.93	-0.79	-0.17	19
19 Guangdong	0.16	0.00	0.31	0.14	16
20 Guangxi	-1.66	-1.04	1.96	-0.77	26
21 Hainan	-1.10	-1.77	0.25	-1.05	27
22 Chongqing	-4.22	1.35	-0.25	-1.70	30
23 Sichuan	-0.95	-1.00	-1.61	-1.09	28
24 Guizhou	-3.06	-1.19	0.31	-1.83	31
25 Yunnan	-0.86	-0.58	0.22	-0.57	23
26 Tibet	2.44	-0.15	-0.96	0.97	3
27 Shaanxi	0.64	-0.22	0.73	0.38	11
28 Gansu	2.94	-2.98	0.85	0.68	6
29 Qinghai	1.71	0.28	-2.61	0.43	10
30 Ningxia	0.73	-0.68	2.40	0.60	8
31 Sinkiang	0.10	-0.84	0.03	-0.21	21

The hierarchical clustering analysis (HCA) method is applied to analyze the data by using the statistical software of SPSS and the outcome is obtained( as below):

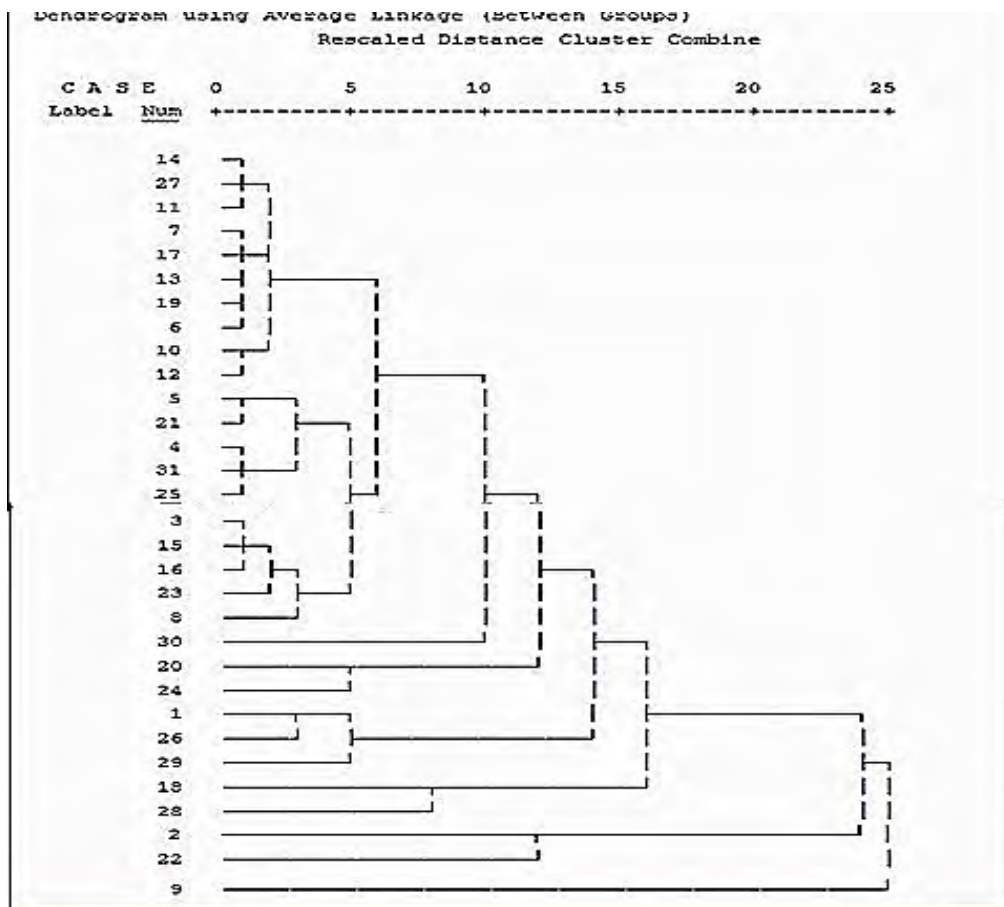


Figure 2 Variables Cluster Tree Structures

According to the above figure, 31 provinces of China are divided into the following 5 classes:

The first class: Beijing, Qinghai, Tibet. The medical service prices and clothes prices are higher in these provinces.

The second class: Hunan, Gansu. Their medical care and personal items, entertainment and education and inhabitancy prices are higher.

The third class: Hebei, Shanxi, Inner Mongolia, Liaoning, Heilongjiang, Hubei, Jilin, Jiangsu, Jiangxi, Liaoning, Shaanxi, Yunnan, Zhejiang, Anhui, Fujian, Shandong, Henan, Guangdong, Guangxi, Hainan, Sichuan, Guizhou, Yunnan, Shaanxi, Ningxia, Xinjiang. As an example, Hubei province in the basic survival material consumption and development material consumption is in the middle level.

The fourth class: Tianjin, Chongqing. In these provinces, the prices of food, alcohol and tobacco, family facilities and maintenance service and entertainment and education are higher.

The fifth class: Shanghai. Both the price of medical care and personal items and the price of entertainment and education are higher in Shanghai.

## 6 Summary

In this paper, the principal component analysis (PCA) method is applied to analyze the data of China's monthly CPI by Category of 2011 among the country's 31 provinces. And the dynamic year-on-year data is simplified into principal component scores in static state. It simplifies the evaluation standard and the relative positions of provinces on the main shaft is obvious. This makes it great convenient to compare the situation of CPI in different provinces.

Then this article uses hierarchical clustering analysis (HCA) method divided 31 provinces in the country into 5 kinds by treating 3 main component scores as variables. The results of the classification is in line with the basic level of economic development and the consumption structures in every province.

In a word, it is easy to find the gaps between the provinces and find out the key points, then take corresponding measures to narrow gaps.

## 7 Conclusion

Price is the comprehensive reflection of economy operation, so controlling the commodity prices plays an active role in controlling society. In terms of narrowing the gaps between provinces, several suggestions are listed, as follows:

### 7.1 The CPI should be compiled and published more accurately, efficiently and reasonably

As an economic index reflecting the extent of inflation or deflation of our country and the basis that the central bank judges whether increases interest rates, the objectivity and authenticity of CPI play very important roles. In terms of technical level, the concerned departments should timely adjust a basket of specification product and the corresponding weights with the change of the living standards and the upgrades of consumption structure of residents. The durable consumer goods such as inhabitancy should be redefined. The case of out of the market prices by virtual rent should be corrected. When determining the weight, this article suggested adopting the combination of the sampling survey method and the method that choose the typical cases by classification to determine a number of key subjects. In the establishment of index system, a single CPI is not able to fully reflect all aspects of the overall complex economic phenomena, therefore it is needed to combine specific purpose, adding more rich connotation of relevant index, and to pay attention to the combination of the total index and the group indicators, and of the absolute index and the relative index. In the information system, it is needed to establish organization system composed of officials, schools, research institutions, professional statistical information companies and so on, for promoting the development of the non-governmental statistical industry, for correcting the situations of providing data for the politics, and for maintaining the statistical data accuracy.

### 7.2 Distinguishing the gap between the regions and industries, timely and precisely controlling prices

From the above to the CPI three-dimensional data research It is not difficult to find that the consumption levels of residents in the country's 31 provinces are different. All provinces should take measures according to their own characteristics.

First, the fuel of water and electricity is the highest weight in the category of living, and influences the living prices greatly. At present, the water and electricity fuel prices are mostly the prices mandated by the government or guided prices, therefore there are certain price controls. But the governments of

some provinces where the living prices are higher should pay much attention to scheduling and conducting of coal, electricity, and gas, in order to prevent from the cost aspect pushing the increase of downstream products prices, then promoting the increase of CPI.

Second, the sequential increase of downstream products prices pulled by the increase of food prices is one of the main driving forces pushing the CPI up. Although smoking prices is under the certain regulation of government, due to that the rise of food prices will occupy the tobacco plantation area, that is to say that the smoke products also may have the pressure of the refiners. So, in the agriculture developed provinces, we should continue to carry out the policy of agricultural support, prevent natural disasters such as floods, and guarantee the supply of main agricultural products and important agricultural production materials. On the other hand, we should as well perfect the reserve system, reasonably reduce circulation cost such as the transportation cost, which can reduce the prices of food, cigarettes and supplies in some provinces.

Third, in terms of the provinces where the prices of medical care and personal items, traffic and communication and entertainment and education are higher, local governments should control the price adjustment rhythm and strength of service prices effectively, strengthen the supervision and management of service prices, strictly control the standards of tuition, medical fees, transport costs and so on, reinforce the infrastructure construction of traffic, electric power, communications and the program of raising prices should be open, reasonable and transparent, and sometimes it should strictly carry out the price system of hearing. What's more, raise in price of lift should be prevented strictly.

Forth, it is needed to maintenance market normal business activities, strike price offenses. The illegal activities of colluding in price rising, disguised price increases and hoarding hype and so on by give priority to economic means and legal means, assisted by the necessary administrative means.

Fifth, social security system and subsidy system should be perfected. It is needed to establish and perfect the lowest life guarantee, unemployment insurance standards and so on, so that income expectation and prices bearing ability of residents in different provinces can be enhanced.

Sixth, the price regulation of the new period should be with international vision and strengthen international coordination.

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# On the Construction of Quality Evaluation Index System for Innovation and Entrepreneurship Education in Research-oriented Universities\*

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**Abstract:** With the development of innovation and entrepreneurship education in Chinese universities, setting up a quality evaluation has become a topic of concern. The paper combines the goals and features of innovation and entrepreneurship education in research-oriented university, analyses the main elements of education quality and, accordingly, constructs a quality evaluation index system for innovation and entrepreneurship education. It employs analytic hierarchy method to determine index weights at all levels, for a comprehensive scientific research innovation and entrepreneurship at research-oriented universities to provide a basis for evaluating the quality of education.

**Key words:** Innovation and entrepreneurship education; Quality evaluation; Index system; AHP

## 1 Introduction

Pursuant to the development strategy of "improving independent innovation ability to build an innovative country" and "creating jobs by encouraging entrepreneurship" proposed by the 17<sup>th</sup> National Congress of the Communist Party of China, Chinese Ministry of Education explicitly set out to promote innovation and entrepreneurship education in universities in its published document "Promoting Innovation and Entrepreneurship Education in Universities and Encouraging Students' Business Initiatives", and "The National Medium and Long-term Educational Reform and Development Planning (2010-2020)".

As an adaptation to economic, social and national development strategy needs, the education concept and mode, i.e. innovation entrepreneurship education, through related courses activities, can exert education and effects on students through unification of education, research, simulation and exercises, develop students' awareness of innovation entrepreneurship spirit, autonomous pioneering spirit and hands-on skills. It is an important initiative to enhance university core competitiveness, and the need to talent training strategy<sup>[1]</sup>. Unfortunately innovation entrepreneurship education in our country is in its pilot stage, and related research results are few, mostly confined to discussion on the necessity of evaluation, not to mention the study on evaluation index system, particularly, in research-oriented universities, there are no established scientific quality assessment and control system of perfecting the system of modes, lacking in overall supervision of the process of innovation and entrepreneurship education and performance<sup>[2]</sup>, therefore, it is of great theoretical and practical significance to build an innovation and entrepreneurship education quality evaluation index system in research-oriented universities with higher application value.

## 2 Content of Quality Evaluation Index System for Innovation and Entrepreneurship Education

Given the complexity of university innovation entrepreneurship education work itself, it is quite difficult to evaluate its quality with a sole dimension for objective precise comprehensive summary and reckoning, thus many of the contents and objects need to be evaluated as system integrant part value realization form which is connected with one another. By constructing a comprehensive evaluation index system, with "elements + relationship", the form carries on objective, practical, easy-to-control presentation<sup>[3]</sup>. This article mainly adheres to the following principles in construction of indicator system: strategic target orientation, system coordination, comprehensive completeness, objective scientific nature, dynamic flexibility, manipulation and so on<sup>[4]</sup>. and a comprehensive analysis of

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research-oriented University education levels, features, objectives, contents, structure, etc, while taking into account students' personality and family background and school innovation and entrepreneurship influence of environments on the quality of education to determine index design and evaluation methods, from the perspectives of innovation and entrepreneurship education results evaluation and process inputs identify the such five evaluation contents as entrepreneurship education environment in colleges and universities, teaching staff, the quality of teaching, students, social reputation<sup>[5]</sup>:

### **2.1 University environment**

The environment has manifested research-oriented university organization support and resources investment for the innovation education, mainly including hard environment and soft environment: the former refers to various safeguard measures in innovation entrepreneurship funding and infrastructure aspects, like establishing entrepreneurship center; the latter refers to academic and cultural atmosphere for innovation entrepreneurship education, respecting entrepreneurship, and tolerance of failure and the intrinsic substance guarantee to stimulate students' entrepreneurial spirit and passion through relevant policies and measures

### **2.2 Teaching**

Teaching is the education implementation link of innovation education, its main appraisal aspect lies in correlated theories and the design and the arrangement of curricula: discipline construction, namely: entrepreneurship consciousness, knowledge, strategy, ability, quality and so on; Teaching methods, in addition to traditional classrooms, teachers, textbook teaching, also should increase social survey, case studies, lecture interaction, entrepreneurial simulation and real business practice mode to enhance the innovation capability of students.

### **2.3 Faculty**

Innovation entrepreneurship education of research type university eventually is to implement through teachers, thus faculty is an important factor in education quality evaluation, and it mainly contains such basic conditions as teacher background, i.e. academic titles university teachers should possess for innovation entrepreneurship education, expertise, quality skills and work experience; teachers' innovation entrepreneurship capacity, i.e. teachers' research innovation consciousness, capacity and related achievements; teachers' innovation entrepreneurship capacity, i.e. the mastery of innovation entrepreneurship education theories and teaching methods.

### **2.4 Student evaluation**

Student Evaluation consists primarily of students' evaluation of their background, performance and satisfaction. Student background refers to family background for innovation and entrepreneurship, education experience, ideas, personality traits, abilities and qualities and other information; student performance refers to achievements in innovation and entrepreneurship learning, practice; student satisfaction is, namely, their sense of identity, initiative and participation in university innovation and entrepreneurship education courses.

### **2.5 Social reputation**

Social reputation mainly refers to the social impact of colleges and universities in the fields of innovation and entrepreneurship, academic status; a series of academic contacts and achievements in the outside academic innovation as well as evaluation of the effectiveness of graduates' innovation and entrepreneurship.

This article takes the above appraisal content as a master line, constructs a set of innovation and entrepreneurship education quality evaluation index system after screening by using expert investigation method, including 5 level-2 indicators, 13 level-3 indicators, as shown in Table 2<sup>[6]</sup>.

## **3 Evaluation Criteria and Weight Determination**

In view of the diversity and complexity of innovation and entrepreneurship education index in research-oriented University, this article uses analytical hierarchy process (AHP) for the determination of weight in dominant indicators.

First, establish hierarchical structure (A-B-C), and defines corresponding relations between target and variable according to index system; Then, using Delphi method, several experts carry on the allocation to each target, add up their allocation, then divide it by population, and finally obtain the triangle fuzzy judgment matrix and the general judgment matrix. Due to space limitation, only level indicator B judgment matrix is listed, as shown in Table 1:

**Table 1 Level Indicator (B ) Judgment Matrix**

A	B1	B2	B3	B4	B5
B1	(1,1,1)	(4/5,1,3/2)	(4/3,2,7/2)	(1,3/2,5/2)	(3,4,6)
B2		(1,1,1)	(1/6,1/4,1/3)	(3/4,1,5/4)	(4/3,2,8/3)
B3			(1,1,1)	(5/2,10/3,5)	(3,5,8)
B4				(1,1,1)	(5/3,2,10/3)
B5					(1,1,1)

According to triangular fuzzy judgment matrix in table 2, the weight can be calculated in between dominant and non-dominant indicators and weights under non-dominant one, calculations are as follows<sup>[7][8]</sup>:

(1) The integrated fuzzy value of first object *i* is as follows:

$$S_i = \sum_{j=1}^m M_{gi}^j \otimes \left[ \sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1} \quad (i = 1, 2, \dots, n) \tag{1}$$

$M_{gi}^j$  refers to the degree value of object *i*'s objective *j*

$$\sum_{j=1}^5 M_{g1}^j = \left[ \left( 1 + \frac{4}{5} + \frac{4}{3} + 1 + 3 \right), \left( 1 + 1 + 2 + \frac{3}{2} + 4 \right), \left( 1 + \frac{3}{2} + \frac{7}{2} + \frac{5}{2} + 6 \right) \right] = (7.13, 9.5, 14.5)$$

$$\text{likewise: } \sum_{j=1}^5 M_{g2}^j = (10.83, 15.33, 23.5); \quad \sum_{j=1}^5 M_{g3}^j = (5.96, 8, 11.5)$$

$$\sum_{j=1}^5 M_{g4}^j = (4.07, 4.97, 7.06); \quad \sum_{j=1}^5 M_{g5}^j = (1.97, 2.45, 3.01)$$

$$\sum_{i=1}^5 \sum_{j=1}^5 M_{gi}^j = \left[ (7.13 + 10.83 + 5.96 + 4.07 + 1.97), (9.5 + 15.33 + 8 + 4.97 + 2.45), (14.5 + 23.5 + 11.5 + 7.06 + 3.01) \right]$$

$$= (29.96, 40.25, 59.57)$$

$$\left[ \sum_{i=1}^5 \sum_{j=1}^5 M_{gi}^j \right]^{-1} = (29.96, 40.25, 59.57)^{-1} = \left( \frac{1}{59.57}, \frac{1}{40.25}, \frac{1}{29.96} \right)$$

(2) Based on formula 1, the following can be obtained

$$S_1 = (7.13, 9.5, 14.5) \left( \frac{1}{59.57}, \frac{1}{40.25}, \frac{1}{29.96} \right) = (0.1197, 0.2360, 0.4840)$$

Likewise, it may result in:

$$S_2 = (0.1818, 0.3809, 0.7844); \quad S_3 = (0.1001, 0.1988, 0.3838)$$

$$S_4 = (0.0683, 0.1235, 0.2356); \quad S_5 = (0.0331, 0.0609, 0.1005)$$

If  $M_1 = (l_1, m, u)$ ,  $M_2 = (l_2, m_2, u_2)$ , then the possibility of  $M_1 \geq M_2$  is:

$$V(M_1 \geq M_2) = \text{hgt}(M_2 \cap M_1) = \frac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)} \tag{2}$$

$$\text{Then: } V(S_2 \geq S_1) = \frac{0.1818 - 0.484}{(0.2360 - 0.484) - (0.3809 - 0.1818)} = 0.6759$$

Likewise:  $V(S_1 \geq S_2) = 1$ ;  $V(S_1 \geq S_3) = 0.8765$ ;  $V(S_1 \geq S_4) = 0.5074$ ;  $V(S_1 \geq S_5) = 0.1232$ ; others like  $V(S_i \geq S_k)$   $k \neq i$  won't be listed here.

(3) Weight vector is:

If  $d'(B_k) = \min V(S_i \geq S_k), k = 1, 2, \dots, 5, k \neq i$ , then the weight is:

$$w' = [d'(B_1), d'(B_2), \dots, d'(B_5)]^T = [0.5074, 1, 0.5065, 0.3985, 0.2369]^T$$

After normalization, we get:

$$W = [d(B_1), d(B_2), \dots, d(B_5)]^T = [0.1915, 0.3775, 0.1912, 0.1504, 0.0894]^T$$

Similarly, an approximation of level three sub-index weight can be calculated based on the fuzzy judgment matrix of level three sub-indicators

4) Consistency testing:

When the judgment matrix deviates the uniformity, the above computation relative weight vector method has certain unreliability, therefore a consistency testing must be carried on, the concrete step as follows shows:

1)The coincident indicator of parameter -- C.I.:  $C.I. = \frac{\lambda_{\max} - n}{n - 1}$  ; (3)

Where  $\lambda$  Max is the maximum eigenvalue of the matrix, you can take a common calculation of eigenvalue method or formula 4:

$$\lambda_{\max} = \sum_{i=1}^n \frac{(AW)_i}{n \omega_i} = \frac{1}{n} \sum_{i=1}^n \frac{\sum_{j=1}^n a_{ij} \omega_j}{\omega_i}$$
 (4)

2)Find the corresponding mean random consistency index R.I. in accordance with table,;

3)The coincident indicator of parameter --C.R.:  $CR = \frac{CI}{RI}$  (5)

If C.R.<0.1, then through the consistency of judgment matrix testing; if C.R. ≥ 0.1, the judgment matrix should be suitably amended.

4)Calculate total order weight of elements for the target layer-by-layer . Calculate each single weight under guidelines top- down after synthesis, then layer-by-layer overall consistency judgment and testing.

If  $W^{(k-1)} = (\omega_1^{(k-1)}, \omega_2^{(k-1)}, \dots, \omega_{n_{k-1}}^{(k-1)})^T$  stands for the sort weight vectors of  $nk-1$  on the  $k-1$  level relative to the general objective, and  $P_j^{(k)} = (p_{1j}^{(k)}, p_{2j}^{(k)}, \dots, p_{n_k}^{(k)})^T$  stands for the sort weight vectors of  $nk$  on the  $k$  level relative to the element  $j$  on the  $k-1$  level, which also is matrix of  $n_k \times n_{k-1}$  step, in which the elements have no influence from element  $j$  get 0 weight vectors; then, the general sort of elements  $W(k)$  on the  $k$  level relative to the objective is:

$$W^{(k)} = (\omega_1^{(k)}, \omega_2^{(k)}, \dots, \omega_{n_k}^{(k)})^T = P^{(k)} \bullet W^{(k-1)}$$
 (6)

Or:

$$\omega_i^{(k)} = \sum_{j=1}^{n_{k-1}} p_{ij}^{(k)} \omega_j^{(k-1)}$$
 (7)

And the general formula is:  $W^{(k)} = P^{(k)} P^{(k-1)} \dots W^{(2)}$  (8)

Meanwhile, according to formula 3, the coincident indicator  $CI_j^{(k)}$  of element  $j$  on  $k-1$  level can be obtained, and then, coincident indicator  $RI_j^{(k)}$  obtained from the table can be used with formula 5 to get the coincident indicator  $CR_j^{(k)}$  ( $j=1, 2, \dots, nk-1$ ). Then, according to the following formula, we can get the overall indicator of  $k$  level:

$$CI^{(k)} = (CI_1^{(k)}, \dots, CI_{n_{k-1}}^{(k)}) \bullet W^{(k-1)}$$
 (9)

$$RI^{(k)} = (RI_1^{(k)}, \dots, RI_{n_{k-1}}^{(k)}) \bullet W^{(k-1)}$$
 (10)

If the CR (k) < 0.1, you can view the index system of the  $k$  hierarchical structure through consistency test for all judgment matrix, with full satisfaction. If all weights are made through consistency test, all levels of target weights can be obtained in the innovation imbarck education quality appraisal target system. Concrete results are shown in table 2:

**Table 2 Innovation and Entrepreneurship Education Quality Evaluation Index System of Research-type University**

Evaluation system A	Level indicator B	Level indicator C	Level indicator D	Weight
Innovation and entrepreneurship education quality evaluation index system A of research-type	University environment B1 0.1915	soft environment C11 0.3807	number of entrepreneurial D111	0.0228
			Number of seminars held D112	0.0158
			number of entrepreneurial competition D113	0.0174
			School and enterprise cooperation project number D114	0.0169



University				
		hard environment C12 0.6193	Number of innovation and entrepreneurship centers or similar institutions D121	0.0235
			the student coverage of entrepreneurial activity funding D122	0.0189
			entrepreneurship ratio after students' participation in entrepreneurship education programs D123	0.0202
			Incubator and open ratio of supporting services for students D124	0.0276
			Number of students received innovation practice base D125	0.0137
			Innovation achievement conversion rate D126	0.0147
	Teaching B2 0.3775	Curriculum design C31 0.6750	Core courses open rate D311	0.0519
			Practical curriculum hours D312	0.0557
			student participation rate of practical curriculum D313	0.0447
			Interdisciplinary curriculum start rate D314	0.0395
		teaching method C32 0.3250	Penetration of business knowledge in the existing curriculum D315	0.0630
			Number of interviews and speeches of entrepreneur D321	0.0492
	faculty B3 0.1912	teacher background C21 0.2924	Business Plans, research reports, case teaching ratio D322	0.0735
			Ratio of teachers who have experience of starting businesses D211	0.0120
			Entrepreneurship and corporate management training experienced teacher ratio D212	0.0207
			ratio of higher education D213	0.0103
		Innovation and entrepreneurship capability C22 0.4079	proportion of senior professional titles D214	0.0129
			Number of papers quoted and adopted by relevant government departments D221	0.0230
			innovation achievement transformation proportion D222	0.0224
			Teachers' attachment to enterprise training D223	0.0183
		Innovation and entrepreneurship teaching ability C23 0.2997	Innovation and entrepreneurship-related knowledge assessment D224	0.0143
			published theoretical results on Innovation and entrepreneurship education D231	0.0211
			Innovation and entrepreneurship education case mining capabilities D232	0.0230
			Teachers' participation in the social practice of industry innovation and entrepreneurship D233	0.0132
	student evaluation B4 0.1504	student background C41 0.2826	Teachers' participation in the social practice of industry innovation and entrepreneurship D233	0.0132
			The proportion of students with work experience D412	0.0101
			proportion of students from Family-run businesses D413	0.0098
			Proportion of part-time students D414	0.0101
		student performance C42 0.3903	Proportion of students with related training experience D415	0.0125
			Student innovations' increase rate D421	0.0134
			The proportion of students entrepreneurship as a career choice D422	0.0167
			Students' innovation and entrepreneurship knowledge examination scores D423	0.0124
Student satisfaction C43 0.3271		Innovation or entrepreneurship prospectus quality D424	0.0162	
		Entrepreneurship course attendance rate D431	0.0168	
		increase rate of Students' participate in research activities D432	0.0142	
		Students in entrepreneurship teaching quality evaluation D433	0.0182	
social reputation B5 0.0894	social impact C51 0.2864	social impact, academic impact, academic status D511	0.0256	
		the field of innovation and entrepreneurship Conference held D521	0.0140	
	External academic links C52 0.3311	Publication of academic journals in the fields of innovation and entrepreneurship D522	0.0156	
		Graduate evaluation C53 0.3826	Students' entrepreneurial success rate D531	0.0146
	Students' increased employment rate D532		0.0196	

## 4 Conclusion

Quality evaluation is the core of innovation and entrepreneurship education in research-oriented University, so it needs to systematically collect, collate relevant information through improved scientific evaluation index system and judge from investment and benefit, subsequently obtains an objective and comprehensive quality appraisal results from the angles of reliability and validity. This article draws on innovation and entrepreneurship education quality evaluation index of research results at home and abroad, takes into consideration the impact of input and effects of innovation and entrepreneurship education environment in colleges and universities, teachers, teaching and learning environments, student evaluation and social reputation, builds innovation and entrepreneurship education quality evaluation system of research-oriented universities in China. In practical applications, appropriate changes and adjustments can be made according to academic strengths, innovation and entrepreneurship and its own characteristics.

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# The Analysis of Influence Factors on China Clothing Export

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**Abstract:** Taking China clothing export as the research object, this paper mainly analyses the impact that some factors such as GDP of foreign countries and China, exchange rate, export rebate rate, technical barriers to trade impose on China clothing export by using augmented gravity model and the panel data from 1995 to 2009. The model results reveal that the GDP in foreign countries and China imposes great positive influence on China clothing export while the exchange rate and technical barriers to trade have negative effect on it. Finally the paper puts forward some suggestions based on the empirical result. It is expected to be of important reference value in promoting China clothing export.

**Key words:** Clothing export; Augmented gravity model; Exchange rate; Export rebate rate; Technical barriers to trade

## 1 Introduction

Since 2000, China has become the largest exporter of clothing, reaching 36.1 billion dollars. With its accession to WTO and the end of textile quotas, China clothing export volume has kept growing at more than 15% speed per year. The export value has broken 120 billion dollars in 2010. America, Japan, Europe and Hong Kong have become the most important markets, whose total import value accounts for over 60% of all export volume in China. In addition, as the pace of national industrial upgrade speeds up, China clothing export trade method has improved. The proportion of export with general trade pattern has significantly higher than that with processing trade pattern and the increase range of export with general trade pattern has exceeded that with processing trade pattern recently.

However with the increasing of production cost, appreciation of the RMB and the popularity of technical barriers to trade, China clothing export is encountering increasingly severe challenges. Export growth declines and the share in the world main market tends to decrease in recent years. Thus it is urgent and crucial to find out the factors that influence China clothing export under the new international environment and put forward development countermeasures. This article attempts from the empirical perspective to discuss this problem and related solution.

## 2 Model Establishment and Data Processing

### 2.1 Introduction of the model

Gravity Model was firstly proposed by Tinbergen, Netherland econometrician. It suggests that bilateral trade value is directly proportional to the economic scale measured by GDP and inversely proportional to the geographic distance. The expression of model is  $T_{ij}=A(Y_i Y_j / D_{ij})$ .

$T_{ij}$  stands for total trade value,  $Y_i$  is the GDP of country  $i$ , while  $Y_j$  is the GDP of country  $j$ .  $D_{ij}$  stands for the geographic distance between two countries.  $A$  is constant.

As the data of this model is high availability and credibility, the application has become more and more wide. Based on the research need, many scholars add several variables, which become augmented gravity model. New variables can be divided into two types, i.e. dummy variable such as common language and system index variable such as preferential trade agreement (PFR).

### 2.2 Establishment of augmented gravity model

In order to figure out the factors that affect Chinese clothing export, this paper draws on precious experience and establishes the following augmented gravity model:

$$\ln(EX_{it}) = \alpha_i + \beta_1 \ln(GDP_{it}) + \beta_2 \ln(GDPCH_t) + \beta_3 \ln(RE_{it}) + \beta_4 \ln(T_t) + \beta_5 i TBT_{it} + \mu$$

Where  $EX_{it}$  is the clothing export volume from China to country  $i$ ,  $GDP_{it}$  is real gross domestic product in country  $i$ ,  $GDPCH_t$  is real gross domestic product in China.  $RE_{it}$  is bilateral real exchange rate,  $T_t$  is Export Rebate Rate of clothing in China.  $TBT_{it}$  is dummy variable, standing for the report amount of TBT in country  $i$ . If there is no report before the year of  $t$ , the value is 0; if there is any report, then the value is 1. However, if there is any report after the year of  $t$ , the record becomes 2, etc. Because the distance is almost constant and the distance of two capitals does not equal to the transportation

distance, the variable of distance is deleted.

**2.3 Data sources**

Compared with series data, panel data can reduce the heterogeneity of different importers and the multicollinearity. In addition, it can enhance the degrees of freedom and validity of parameter estimation. Therefore, this paper uses panel data from 1995 to 2009. The associates are USA, Japan, Hong Kong, German, England, Russia, Canada, Italy, France and Australia. The data of GDP comes from UN database, while the export value is collected from the United Nations Commodity Trade Statistics Database. Export Rebate Rate is classified by the author and the reports of TBT are from the web of the State Bureau of Quality and Technical Supervision. Exchange Rate is from United Nations FAO Database.

**2.4 Estimation and test of the model**

**2.4.1 Unit Root Test and Co-integration Test**

In order to avoid the spurious regression, which means that several series data change in the similar tendency though they are not related directly, unit root test is performed. The result is as follows:

**Table 1 Unit Root Test Result**

Variables	LLC	Fisher-ADF	Fisher-PP
Ln(EX)	0.79690	8.28582	7.69272
Dln(EX)	-4.27736***	48.0152***	70.1423***
Ln(GDP)	11.7803	12.2671	1.42219
Dln(GDP)	-3.15608***	32.6984**	31.5838**
Ln(GDPCH)	8.46582	0.02245	0.00963
Dln(GDPCH)	-10.0646***	109.313***	108.896***
Ln(RE)	-2.73136	28.2144	19.6589
Dln(RE)	-6.86171***	68.0093***	75.5781***
Ln(T)	0.26329	10.1288	10.1288
Dln(T)	-10.7069***	119.642***	119.057***
TBT	9.30524	0.07746	0.01847
D(TBT)	-6.77624***	37.7177***	60.3523***

Note:\*\*\* denotes rejection of the null hypothesis at 1% level.

As is showed in the table, at 1% level of significance all series are found to be I(1), though they are not stationary at levels. Thus, it will be essential to proceed to co-integration test to check for the existence of long-run relationships among series. The result is showed in the table 2. From it, we can conclude that there are co-integrating relationships between explanatory variables and explained variable.

**Table 2 Co-integrating Test**

	Panel ADF	Group ADF
value	-3.999250***	-6.510418***

Note:\*\*\* denotes rejection of the null hypothesis at 1% level.

Since there is evidence of co-integration, estimation of export is performed to examine the impact of GDP, Exchange Rate, Export Rebate Rate, and Technical Barriers to Trade on Chinese Real Clothing Export.

**2.4.2 Model Form**

There are three forms of panel model, whose expressions are as follows:

- A: Varying -Coefficient Models  $Y_{it} = \alpha_i + \beta_i X_{it} + \mu_{it}$
- B: Variable Intercept Model  $Y_{it} = \alpha_i + \beta X_{it} + \mu_{it}$
- C: Constant Coefficient Model  $Y_{it} = \alpha + \beta X_{it} + \mu_{it}$

To decide the form of panel model, analysis of covariance is applied. If the null H2 Hypothesis is rejected, Constant Coefficient Model is applied.

$$H_2: \alpha_1=\alpha_2=\dots=\alpha_N \quad \beta_1=\beta_2=\dots=\beta_N$$

$$F_2 = \frac{(S_3 - S_1) / [(N - 1)(K + 1)]}{S_1 / [NT - N(K + 1)]}$$

Where  $S_3$  is the sum of squared residuals in Constant coefficient model,  $S_1$  is the sum of squared residuals in Constant coefficient model.  $N$  is the number of cross-section members.  $T$  is sample period and  $K$  is the number of explanatory variables except the constants.

The calculation shows that  $F_2$  equals 0.348, while the critical value is 1.486. So the null hypothesis is accepted and constant coefficient model is adopted.

The model expression is:  $\ln(EX_{it}) = \alpha + \beta_1 \ln(GDP_{it}) + \beta_2 \ln(GDPCH_{it}) + \beta_3 \ln(RE_{it}) + \beta_4 \ln(T_{it}) + \beta_5 TBT_{it}$

#### 2.4.3 Regression Analysis

By means of Eviews6.0, econometric result is as follows:

$$\ln(EX_{it}) = 0.521 + 0.371 * \ln(GDP_{it}) + 1.438 * \ln(GDPCH_{it}) - 0.397 * \ln(RE_{it}) - 0.237 * \ln(T_{it}) + 0.123 * TBT_{it}$$

(7.232)            (12.715)            (-17.172)            (-1.770)            (3.082)

$R^2 = 0.860057$              $D.W. = 0.193914$              $F = 176.9975$

The t value of all variable except Export Rebate Rate is greater than the critical value, namely 2.131. That is to say that all the other variables are significant. However, the coefficient symbol of  $T$  and  $TBT$  disagrees with the theory analysis, which implies the existence of serial auto-correlation. Therefore,  $AR(1)$  is introduced and the new model is formed.

$$\ln(EX_{it}) = \alpha + \beta_1 \ln(GDP_{it}) + \beta_2 \ln(GDPCH_{it}) + \beta_3 \ln(RE_{it}) + \beta_4 \ln(T_{it}) + \beta_5 TBT_{it} + \beta_6 AR(1)$$

With the help of static software, econometric result is:

$$\ln(EX_{it}) = -8.772 + 1.852 * \ln(GDP_{it}) + 1.069 * \ln(GDPCH_{it}) + 0.700 * \ln(RE_{it}) - 0.092 * \ln(T_{it}) - 0.026 * TBT_{it} + 0.950 * AR(1)$$

(5.738)            (3.353)            (11.285)            (-2.535)            (-1.962)

$R^2 = 0.9902$              $D.W. = 2.14$              $F = 834.6571$

The goodness-of-fit is improved evidently and the t-test shows that significance of all variables is at 95%. Besides the value of  $D.W.$  is greater than 2, which means that serial auto-correlation has removed. And the symbol of all explanatory variables except the variable of export rebate rate coincides with theoretical results.

#### 2.5 Findings

Economically, the symbols of explanatory variables stand for elasticity in the double logarithm model. The GDP elasticity coefficient of export is 1.852, which means that when GDP in foreign countries increases by 1%, the clothing export will increase correspondingly by 1.852%. The elasticity of GDP in China is 1.069, while that of exchange rate is 0.7. Technical Barriers to Trade will exert negative effect on clothing export in China. The hysteresis quality of Export Rebate Rate is the main reason that the sign of coefficient is inconsistent with theoretical analysis.

### 3 Conclusions

The regression analysis result shows that the GDP in foreign countries and China imposes great positive influence on China clothing export, while the exchange rate and technical barriers to trade have negative effect on it. Therefore, on the basic of cementing traditional market, clothing industry in China should actively develop new markets to disperse risks. In addition, they should proceed from product and increase added-value by means of discrepancy and brand strategy. Only in this way, can the influence of exchange rate, Technical Barriers to Trade and export rebate rate be reduced. High quality, unique culture connotation and excellent service are the guarantee of brand establishment. The dream of clothing great power can be realized if all these factors can be improved.

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## Financing Risk Model and Countermeasures of the Television Media Industry

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**Abstract:** Economic globalization makes market-oriented operation of the television industry imperative. But the income structure of China's television industry is irrational. The form of making profits is narrow. External financing is an important choice for the television media industry in China to keep up with advances in information technology. However, there are a lot of risks because of the particularity of China's television industry external financing. Based on the perspective of risk management, this article uses the Cobb-Douglas production function as the return on investment functions, measures the risk of state assets losing and the risk of control over the decentralized in the television media industry in China by comparing the external investment return on investment function and not. Finally, based on the results of qualitative analysis and quantitative research, this article points out that the improvement of technical strength, making managers work harder, treated with caution on gambling agreement are effective countermeasures to deal with financing risks.

**Key words:** Financing Risks; Risk Assessment Model; Manage Countermeasure; Television Media Industry

### 1 Introduction

With the rapid development of Internet technology, the TV media industries market operation has shown a diversified, modern trend over the world. Economic globalization makes market-oriented operation of the television industry is imperative. However, China's TV media industry is gradually out of line with the development of information technology. The income of China's television industry structure is irrational. The form of making profits, which mainly comes from the earnings in ads, is narrow. Because of strong political colour of the television media industry in China, the financing of industry mainly depends on government funding, internal financing and policy loans, did not take full advantage of the capital markets for external financing.

Given the basic status quo, in order to carry out effective market-oriented operation China's television industry must enrich the profit model, expanding financing channels. There are many ways to achieve this aim, but the external financing becomes a good solution of the funds required to the television media industry technical update and improve overall operational efficiency. Meanwhile, it will also bring some risks, one of the most important thing is that the risk of loss of state assets and control of risk diversification. Therefore, it is important to study and make appropriate management strategies of financing risks before external financing. This is also the purpose of writing this article.

The researches of the media industry financing risks focus on the following aspects. In the world, the researchers analysed Media Economics from the economics perspective. The relationship between consumers and producers in the media market, media and capital markets, media ownership, government and the media industry and other researches were done<sup>[1][2]</sup>. Pieard (1989) analysed the media phenomenon from the view of economic. He combined economics theory and the special phenomenon of the media market, analysed the decision-making process of market entities (producers, consumers and government), media cases and media economic phenomena, introduce the particularity of the general principles of market economy and the media market<sup>[3]</sup>. Harold L Vogel (2002) carried out a detailed analysis of the capital operation, operational efficiency and other issues of the entertainment industry (mainly including the media industry)<sup>[4]</sup>. In China, the studies of the media industry are mostly concentrated in the motivation of capital operation, the feasibility of capital operation, capital operations, and government decision-making on the financing strategy of the media industry, etc.<sup>[5]</sup>. Zhou (2004) chose the most difficult and most complex TV operators as a case in-depth analysis of the inevitability of the media capital operation, the way they operate, venture capital, strategy, and the government position in the media capital operation, and also presents some specific approaches of some media entity in the process of implementation of the capital operation. Chen (2005) introduced the inevitability of the media industry to bring in outside investors by Game Theory, constructed a game model for the

allocation of funds in different investment entities, and gave some suggestion about the Chinese media industry investment and financing policy decision<sup>[6]</sup>.

Through the above analysis, we can see that theoretical explanations for the financing risk of the television media research has focused on the perspective from the economics, there are small number of financing risks quantitative research, and these researches did not offer the appropriate risk management strategies. Therefore, based on risk financing perspective, this paper analyse the financing risks of television industry firstly, then use the efficient production function for quantitative analysis of the television media industry financing risks, and finally combine with qualitative analysis and quantitative research, proposed management measures.

## **2 Financing Risk Characteristics of TV Media Industry**

### **2.1 An overview of the television media industry financing risks**

Special social and historical development process, as well as the presence of government factors, China's television industry has its own specialty, both with strong political overtones, but also plays the role of business in a market economy, the specific performance as following points. Firstly, the main function of the TV media is the function of cultural propaganda, but also to shoulder with the corporate responsibility of profitability. Secondly, China's TV media exist in provincial units, media enterprise quantity is many, and scale is small, regional monopoly is strong, due to the level of economic development in different provinces large difference, there is a big gap in the comprehensive strength of the television media.

It is precisely because the government actually controls the television media, and therefore in the choice of financing channels, the Government will carefully consider the risks of external financing for the television media industry. External financing risks associated with the television industry mainly include three aspects. The first is undervalued risk. External investment entities will carry out the market value assessment when they are ready to invest in the television industry. Due to political factors, external investment entities would suspect of TV media which with a strong political overtones can operate in a market economy and sustained profitability, and thus underestimate the market value of the television media. The second is the losing control risk. After television media brought in outside equity investors and with the signing of an agreement on gambling, poor management can induce outside investors to increase the stake at a low price based on a gambling agreement. This is bound to dilute the control of the Government of the television media industry, may eventually lead to the television media are fully market-oriented, the loss of cultural transmission function. The third is losing state assets and brand values risks. The state-owned assets in China's television industry are in the leading position, the particularity of the television industry created a huge brand value. The television media failed efficient operation in a market economy after the introduction of outside investment and continue to profit, considering their own interests, outside investors may sell its equity in order to minimize losses. This will result in the loss of state-owned assets and brand value in the television industry.

### **2.2 Financing risk characteristics**

As mentioned above, the television industry has its particularity; its financing risks have certain characteristics. Firstly, TV media industry financing risk has persistence. Once the external equity or venture capitals were introduced into television industry, it will cause equity to master the different investment entities, and the decline in the proportion of state-owned asset holding. Even some outside investors will enter the television media industry's management, and make investment decisions unfavorable cultural propaganda benefit of the television media. Therefore, the risk of loss of state assets, the risk of loss of brand value, and control over the decentralized risk will always exist which caused by poor management or investment in a different direction.

Secondly, the television media industry financing risk has linkage. External financing of TV media industry is to achieve the goal of cultural and economic benefits of a win-win situation, while external investor's investment objective is to achieve maximum economic efficiency, the two have some differences in interest-driven. TV media industry assets are divided into tangible assets and intangible assets from morphology. Tangible assets mainly refers to the media business assets, including transmission equipment, distribution equipment, network equipment; intangible assets mainly refers to the brand value of the television media, the operating mechanism, the relationship between pipeline and marketing network. Both of which are complementary and inseparable in the process of television media achieving cultural and economic benefits. Therefore, in order to obtain the benefits of the TV media in the dissemination of culture, investment selection will be a part of the capital investment of intangible



assets maintenance. External investors will think more about the television media value of tangible assets when they were in a television media investment value evaluation, and think less about the television media value of intangible assets even ignore them. In addition, the television media to pursue the effectiveness of cultural propaganda, while sacrificing part of the economic benefits. But external investors hope that the capital operation of the television media could achieve maximum economic efficiency. Therefore, the external investors to one-sided pursuit of economic benefit maximization of the investment orientation but ignore the intangible assets investment. This ultimately is bound to have adverse effects for cultural propaganda benefit of the television media industry.

### 3 Assessment Model for Financing Risk in the TV Media Industry

The investment validity by using its own asset should be taken into account before assessing the financing risk of TV media industry. This article takes Cobb-Douglas production function as the basic benefit function.

Suppose the total investment amount of self-owned assets as  $I$

Suppose the factors of production put by the TV media as  $C$  (capital) and  $L$  (labour)

Under the realization of the dual goals, namely the culture propaganda benefit and economic benefit, the overall target that TV media utilizes its own assets to invest is as following:

$$T = T(1) + T(2) = m(C + L) + nf(C, L) \quad (1)$$

$T$  stands for the overall goal of TV media investment;  $T(1)$ , the goal of culture propaganda;  $T(2)$ , economic benefit;  $C$ , scale of investment;  $L$ , labour input;  $f(C, L)$ , the benefit function of investment. Therefore, by using Cobb-Douglas production function, this function can be represented as  $f(C, L) = AC^a L^b$ .  $m$  is the coefficient that investment contributes to the overall target,  $n$  is the coefficient that investment benefit contributes to the overall goal.  $m, n > 0$ . Provide the overall target as the maximum, it can be obtained,  $\max T = \max[m(C + L) + nf(C, L)]$ . Regardless of labour, provide the first derivative as zero for extreme value,  $m + nf'_C(C, L) = 0, f'_C(C, L) = -m/n < 0$

The extreme conditions for profit maximization on investment is  $f'_C(C_0, L) = 0$ , because of the decrease of the marginal benefit caused by scale of investment,

$$f'_C(C, L) = -m/n < f'_C(C_0, L) = 0, C > C_0 \quad (2)$$

Therefore, it can be seen that scale of investment only consideration of economic benefit is less than that of under the consideration of the dual goals, culture propaganda benefit and economic benefit. It also shows that TV media investment risk is less under the double drive of culture propaganda benefit and economic benefit, but the efficiency of state-owned investment is lower and it fails to achieve the effective allocation of capital. As a result, the introduction of external investment is an importance choice for state-owned assets to widen the governance scope of state-owned capital, improve capital structure and enhance the overall competitiveness.

Assuming an external investor is for equity investment. The following assumptions are required to assess TV media financing risk.

Suppose the external financing amount as  $K_1$ , the share of external investor as  $b$ , the minimum required capital return as  $a$ , the input of the owned capital of TV media as  $K_2$  and its share as  $c$

The two parties sign VAM (valuation adjustment mechanism). There are three kinds of decisions for investment effect made by external investors. Firstly, the successful investment which means TV media successfully appears on the market and external investor sells his owned share in the capital market. Secondly, rate of return on investment don't reach the lowest rate of return during observation period and external investors are entitled to increase their shareholding ratio  $d$  at  $P$  per share (lower than the initial outlay  $K_1/b$  per share). Thirdly, the investment didn't work out. And investors apply for liquidation and exit.

In the first case, it is the best state that external capital is sought by this media. The financier can not only repurchase stock but also choose to circulate capital in the market. In the second case, it will bring huge risk to this media: the risk of state-owned assets lost and the risk of decentralized control. In the third case, it causes maximum loss which is the investors and financiers most unwilling to see.

Because of value underestimate risk, happening in the investment negotiation, has low effect on external investment capital operation attracted by this media. And due to that it unable to make appropriate measurement to the brand value loss risk, this paper is mainly to assess the second case. Because, to a great extent, managers' effort degree determines the investment performance, the effort degree of manager, which includes organizing ability, leadership skills, decision-making ability and control ability, should be taken into consideration when payoff function is measured. Combining with Cobb-Douglas generating function, the expected investment profit function of this media can be written into:

$$f(e, K_1, K_2) = A(K_1 + K_2)^a L^b U(e) \quad (3)$$

$A$  stands for the coefficient that the technical strength of TV media contributes to investment returns,  $K_1 + K_2$  is the total capital input,  $L$  stands for labour;  $U(e)$  the coefficient that directors' endeavour to contributes to investment. Thus the overall target function can be described as:

$$T' = m(L + K_1 + K_2) + nf(e, K_1, K_2) = m(L + K_1 + K_2) + nA(K_1 + K_2)^a L^b U(e) \quad (4)$$

As mentioned above,  $m$  stands for the coefficient that investment contributes to overall target;  $n$ , the coefficient that investment returns contribute to the overall target. By comparing the payoff function of TV media before and after acquiring external investments this article studies TV media financing risk based on two situations.

First of all, analyse the function from the perspective of the total revenue regardless of rate of return on investment. If  $T' ? c / (b - c) < T$ , namely the total revenue after TV media acquires external investment is less than that of utilizing its own investment, the financing risk occurs. That is because the external investment causes the loss of national assets and disperses the right of control instead of increasing the total revenue. Here, the loss of the national assets is  $[T' ? c / (b - c) + K_1] ? b / (b - c)$ , the dispersing ratio of control right is  $b / (b + c)$ .

Secondly, from the prospective of investment return rate, when  $[T' - (K_1 + K_2 + L)] / (K_1 + K_2 + L) < a$ , it means that rate of return on investment doesn't reach the minimum capital return rate, financing risk also occurs. VAM signed by TV media and external investors provides that external investors are entitled to increase shareholding ratio  $d$  at  $K_1 / b$  per share if the rate of return on investment is less than the minimum capital return rate. Therefore, the loss of the national assets is  $[T' ? c / (b - c) + K_1] ? (b - d) / (b + c)$ , the risk of control right dispersing is  $(b + d) / (b + c)$ .

#### 4 Management Strategies for Financing Risk in TV Media Industry

According to the total revenue function the TV media gained, we know if the TV media wants to reduce financing risk, they must improve the investment income; however, apart from capital input and labour input, technical force  $A$  and managers' effort  $e$  also have a great influence on the investment income. Therefore, we can make strategies for financing risk from the view of improving technology and the managers' effort.

First of all, TV media should invest sufficient capital to improve its own technical force. With the rapid development of the science and technology and the invention of all kinds of new media, the TV media industries of China must improve their own technical force to meet the demand of the development of the world, if they want improve all-round strength and compete with advanced world TV media industries. Technical force includes delivery equipment, publish equipment and network devices. Investing sufficient capital for improving delivery equipment and efficiency of issuing equipment, and optimizing network system, which can greatly improves investment income for TV media industry and reduces financing risk.

Secondly, the TV media industry should improve the managers' efforts. Managers' efforts mainly consist of management changes and the ability of organization, leadership, control and decision-making after acquiring the external investments. TV media industry should actively change the management to adapt to the fierce market competition, guide managers to learn operation experience from the advanced media group in the world and help managers to improve their organizational ability, leadership ability, ability to control and decision-making ability. The improvements of managers' efforts can make a positive impact to the return of the investment in TV media industry.

Thirdly, TV media industry should be careful with signing VAM (Valuation Adjustment Mechanism) with external investors. China's TV media industry is coated strong political overtones and thus it has an advantage over the advanced media group in the world on the relational network and marketing channel. As a result, TV media industry should take full advantage of this strength to avoid the signing of harsh VAM, the loss of national assets and the dispersing of control right.

## 5 Conclusions

The trend of economic globalization makes the market-oriented operation of China's TV media industry imperative. Venture capital, as one of an effective ways of marketability operation, can update the antique pattern of China's TV media industry, such as the uni-model of profit and multiple financial channels. Some kind of market risk maybe emerges along with the introduction of external venture capital, especially the risk state-owned assets losing and diversification of control. This paper, based on the Chinese current situation and the aspect of risk financing, has constructed the financing risk assessment model of Chinese television media industry from the aspects of validity of innate property investment as well as external venture capital. This model evaluates the financing risks of TV media industry from two aspects. First, when it comes to the point of Investment revenue only, the loss of state-owned assets is  $[T'c/(b-c)+K_1]b/(b-c)$ , and the ratio of control diversity is  $b/(b+c)$ . Second, when taking the aspect of rate of return on investment into consideration in which the rate of return on investment fails the least rate of return on capital requested, the loss of State-owned assets is  $[T'c/(b-c)+K_1](b-d)/(b+c)$ , and the ratio of control diversity is  $(b+d)/(b+c)$ . A financing risk management countermeasure of China's TV media industry is proposed according to the results of qualitative and quantitative research. Other issues involved into this model such as the internal relations between the total revenue before and after acquiring the external investment and the corresponding rate of return on investment, the impact of external investment on the investment efficiency in TV media industry and the impact of managers' efforts on the financing risk will be discussed and studied professionally in the future.

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# Research on Assessment of Agricultural Products Cold Chain Logistics Vulnerability from the Perspective of Social Responsibility \*

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**Abstract:** The agricultural products cold chain of China starts later, and being vulnerable to logistics risk resulting of various factors. It lacks relevant standards of vulnerability assessment. This article takes the social responsibility as the research perspective, and chooses the economic contribution, legal compliance, ethics and morality, public charity as four dimensions to build vulnerability evaluation index system of agricultural products cold chain logistics, and using the principal component analysis to evaluate agricultural products cold chain logistics vulnerability of the six provinces in Central China. The results show that the vulnerability degree from low to high ranking are: Anhui, Jiangxi, Hubei, Shanxi, Hunan, Henan. Through studying on the agricultural products cold chain in this article, the the vulnerability of the system and the frame were added, and it provides a reference.to the reduction of agricultural cold chain logistics vulnerability in China.

**Key word:** Social responsibility; Agricultural products cold chain logistics; Logistics vulnerability; Principal component analysis

## 1 Introduction

The data show that 30%-40% of the total cost of agricultural products is the logistics costs, fresh agricultural products to reach more than 60%, far less than the level of around 10% in developed countries. Loss rate of fresh agricultural products is controlled below 5% in developed countries, but the loss rate is 25%-30% in the harvesting, transport, storage and other logistics chain in our country. In addition to low efficiency, high cost, waste and other factors, poor risk resistance of the cold-chain logistics system of agricultural products is also a huge obstacle in the process of agricultural industrialization in China and the circulation of agricultural products and industrial development. At present, there is a lack of evaluation studies of the anti-interference ability of the agricultural products cold-chain system, and it can't effectively measure and prevent the vulnerability of the logistics.

The beginning study of the vulnerability concentrated in the field of Ecology, Disaster Management and Climate Change. With the continuous expansion of the study scope, the discussion of the vulnerability rang from Natural Science to Humanities and Social Sciences including Political, Economics, Management and Sociology. Weiyang Yu(2012)<sup>[1]</sup> analysis vulnerability factors which affect the regional socio-economic system, based on the conception of the regional socio-economic system. Using five dimensions of population, resources, environment, social, economic build the comprehensive evaluation index system. Using of gray clustering method to evaluate the regional socio-economic vulnerability. Fenxian Yan(2012)<sup>[2]</sup>, starting from the microscopic point view of farmers, in the foundation of Hoovering model, establish the comprehensive evaluation index system and evaluation model of the agricultural drought vulnerability based on the entropy method and the Analytic Hierarchy Process. Dao Chen & Lian Yu(2007)<sup>[3]</sup> studied the security of urban logistics, analyzed the evolution process of the urban logistics vulnerability, and putted forward the vulnerability conception model, built the vulnerability assessment index system of urban logistics from four levels including network topology, infrastructure, operating subject and service assurance. Junmiao Deng(2008)<sup>[4]</sup> analyzed the relationship of the farmers risk and vulnerability of the supply chain of agricultural products from the trading point view. Thought unclose link between the upstream and downstream of the decentralized management of the farmers and supply chain could bring the farmers greater transaction risk, let the degree of vulnerability of the supply chain increased. Yanping Liu(2009)<sup>[5]</sup> linked the vulnerability of supply chain risks and uncertainties, pointing out that implementation of early supplier involvement and strengthen the logistics outsourcing risk management can help reduce the vulnerability of the supply chain. Changbin Chen & Lixin Miu(2009)<sup>[6]</sup> thought vulnerability factors of supply chain including the emphasis on efficiency, outsourcing trends, the impact of globalization, the focus on production and sales, the reduction of the number of suppliers,

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frequent changes in demand, the lack of visibility and lack of confidence.

A lot of literature has discussion on vulnerability deeply, but few scholars study on the agricultural products cold chain logistics vulnerability. The cold-chain of agricultural products as the high energy consumption industries, have an important responsibility for the protection of the environment. Also the operation quality of the system related to public health and social order. As a result, this paper stands on the social responsibility perspective, and uses the principal component analysis method from four dimensions including economic contribution, legal compliance, ethics and morality, public charity. It analyzes the agricultural products cold chain logistics vulnerability of the six provinces in central China, and provides advices and references for the construction of regional agricultural products of the cold-chain.

## **2 Impact of Social Responsibility on Agricultural Products Cold Chain Logistics Vulnerability**

As the society pay more attention to the harmonious development. The public is increasingly concerned about whether the enterprise obeyed the law, protected the environment and participated in public when they pursuit the economic interests. The development of cold-chain enterprises of agricultural products needs a stable and reliable environment. Finishing the social responsibility is the basic conditions to access to social support and recognition. This paper from the four levels of social responsibility to analyze the impact of the agricultural products cold chain logistics vulnerability.

### **1) Economic contribution**

The exist foundation of the cold-chain logistics of the agricultural products system is the farmer's labor, customer support and operations of operators. The purpose of the system to exist is to achieve maximum economic efficiency. If the most basic of these stakeholders' economic contribution are not implemented, bounding to affect the profitability of the agricultural products cold-chain logistics system. Even leading to the dissatisfaction of those stakeholders and producing a variety of conflict, seriously affected the agricultural product cold-chain logistics system stability.

### **2) Legal compliance**

The normal operation of the farm produce cold-chain logistics system must be bound to comply with laws and regulations, various acts of the companies within the system must be within the scope of legal constraints. Stakeholders of the system can not simply the pursuit of economic interests to the neglect of all relevant laws and regulations, tax evasion, tax evasion or illegal tax avoidance, breach of contract the contractual relationship. Once exposed, these acts will affect the reputation and profitability of these stakeholders, resulting in incalculable loss.

### **3) Ethics and morality**

The behavior of the various stakeholders in the cold chain logistics system of agricultural products to comply with business ethics, which is an important condition for the survival. It is to foster healthy social trends, and standardizes the economic order of the inevitable choice. In Agricultural products cold chain logistics system, each stakeholder can exercise self-discipline, we can guarantee an orderly market healthy operation, people assured safe consumption, fundamentally put an end to the illegal behavior.

### **4) Public charity**

Action of charity is the responsibility of a non-compulsory, under the simple kindness driven move, true charitable action is not unrequited. Therefore, if the stakeholders of the agricultural products cold chain logistics system does not perform charitable action and will not be condemned by society. However, the vulnerability of the charity may be in comparison with other industries or enterprises indirectly affect the stability of the system of the entire agricultural product cold chain logistics.

## **3 Construction of Index System on Agricultural Products Cold Chain Logistics Vulnerability**

### **3.1 Principles of vulnerability assessment of cold chain logistics of agricultural products index**

Construction of cold chain logistics of agricultural products vulnerability assessment index system is a complex process, scientific and rational index system is the key to evaluate the research. In the index system should follow the following basic principles:

1) Scientific agricultural cold chain logistics vulnerability assessment index system must reflect the system of science , and accurate positioning system level, identifying potential problems at the same time to satisfy the comparison between the different agricultural products of cold-chain logistics system.

2) Representative. In cold chain logistics system of agricultural products, we must select factors that accurately reflect the status and characteristics of agricultural products cold chain logistics system and component systems for the indicator system from a number of factors. And the index can accurately reflect the vulnerability of the system of scientific computing.

3) Operability. The index of agricultural products cold chain logistics system must be able to not only be a true reflection of the vulnerability of the system, but also access to scientific data. We must also consider the indicators to quantify the degree of difficulty, and try to use the existing statistical data to improve the index system operability.

### 3.2 Assessment index system of agricultural products cold chain logistics vulnerability

Based on the above discussion, this paper selected the GDP of First Industry, Per Capita Annual Disposable Income of Rural Residents, Freight Traffic, General Consumption Price Index of these four indicators to measure the dimension of economic contribution; The dimension of legal compliance is measured by Proportion of Total Fiscal Revenue, Number of Traffic Accidents, Number of Disputes Mediated; The dimension of ethics and morality is measured by Number of Clients, Total Volume of Waste Gas Discharged, Comprehensive Energy Consumption Transport, Storage and Post; The dimension of charity is measured by Number of Social Welfare Institutions, Social Welfare Enterprises and the Number of Social Donations. The specific index system is shown in table 1:

**Table 1 Index System of Agricultural Products Cold Chain Logistics Vulnerability**

Dimension	Number	Index
Economic Contribution	V1	GDP of First Industry
	V2	Per Capita Annual Disposable Income of Rural Residents
	V3	Freight Traffic
	V4	General Consumption Price Index
Legal Compliance	V5	Proportion of Total Fiscal Revenue
	V6	Number of Traffic Accidents
	V7	Number of Disputes Mediated
Ethics and Morality	V8	Number of Clients
	V9	Total Volume of Waste Gas Discharged
	V10	Comprehensive Energy Consumption Transport, Storage and Post
Public Charity	V11	Number of Social Welfare Institutions
	V12	Number of Social Welfare Enterprises
	V13	Social Donations

## 4 Vulnerability Assessment of Agricultural Products Cold Chain Logistics in the Central of China

### 4.1 Data collection and processing

With the implementation of the strategy of central China, the central provinces compete fiercely. As an important fulcrum of central China, Hubei should also make full use of the advantages of a big agricultural province, and clear position in the industry, coordinated and complementary with the central provinces. It should identify the agricultural products cold chain logistics vulnerability to improve the strategies and objectives. According to the above, this paper establishes the vulnerability evaluation index system of agricultural products cold-chain logistics system, the relevant data are collected from the 2011 Statistical Yearbook of the six central provinces. Proportion of total fiscal revenue is accounted for a total revenue of local finance and GDP ratio; Social donation measures by the value of the donated money to the Yushu earthquake before the date of April 23, 2010. Data gets from the Internet and newspapers.

For simple calculation, we collect the raw data to mathematical treatment. V1, V6, V7, V8, V9, V10, six indicators were positively correlated, that is, the greater the value and vulnerability of the stronger, so take the formula:  $X_i = X_i' / X_{imax}$  processing; the vulnerability of the agricultural products cold chain and other indicators were negatively correlated with the vulnerability of agricultural products cold chain, ways to deal with is:  $X_i = 1 - X_i' / X_{imax}$ , where  $X_i'$  said the number of columns of each factor in each, after such treatment, the 13 factors and agricultural cold chain vulnerability relations remained the same.

### 4.2 Model test

Using the factor analysis through the software of SPSS17.0, it gets variance contribution values of each factor variable(eigenvalues), variance contribution rate and the main components of the load, the results show in table 2.

**Table 2 Total Variance Explained**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.706	51.586	51.586	6.706	51.586	51.586	4.907	37.747	37.747
2	2.815	21.651	73.236	2.815	21.651	73.236	3.850	29.613	67.360
3	2.360	18.153	91.389	2.360	18.153	91.389	3.124	24.030	91.389
4	.636	4.893	96.282						
5	.483	3.718	100.000						
6	3.951E-16	3.039E-15	100.000						
7	1.927E-16	1.483E-15	100.000						
8	1.319E-16	1.014E-15	100.000						
9	2.871E-17	2.208E-16	100.000						
10	-4.073E-17	-3.133E-16	100.000						
11	-1.288E-16	-9.910E-16	100.000						
12	-2.161E-16	-1.662E-15	100.000						
13	-3.726E-16	-2.866E-15	100.000						

Extraction Method: Principal Component Analysis.

It can be seen from the table that the cumulative variance contribution rate of the first 3 principal components can reach 91.389%. The first 3 principal components (F1, F2, F3) can represent the original 13 indicators to evaluate the vulnerability factors of influencing the agricultural products cold chain logistics, and also can express the most parts of the index information. At the same time, factors are reduced from 20 to 3, which can simplify the difficulty of analysis, and 3 principal components are not mutually related, and so the issues on the reiteration of the evaluation index information can be avoided.

In order to get of the influencing factors of each principal component factor, to obtain the data of expressing the influence degree of factors, and to make it more clear, the context uses the method of maximum variance orthogonal rotation method to rotate the factor load matrix. Under the help of the SPSS17.0 software, the orthogonal rotation results of the previous principal component load coefficient matrix after 25 iterations are shown in the column 2-4 of Table 3.

**Table 3 Rotated Component Matrix**

	Component		
	1	2	3
V1	.186	.900	-.132
V2	-.536	-.593	.585
V3	-.058	.137	.979
V4	.047	-.909	-.182
V5	.439	.399	-.714
V6	.603	.565	.359
V7	.818	.395	-.199
V8	.220	.924	-.264
V9	.144	-.069	.964

V10	.969	-.218	-.048
V11	-.942	-.007	-.124
V12	-.808	-.445	.260
V13	-.898	-.323	.094

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 a. Rotation converged in 5 iterations.

In order to get the key indicators, we select 10 indicators whose load of principal component factor is more than 0.8, and they are show in bold. Multiplying the absolute value of Index load and the contribution rate of corresponding principal component factor variance to get vulnerability load of agricultural products cold chain logistics. Ranking the data from high to low is the load ranking of agricultural products cold chain logistics vulnerability , as shown in column 6 and 7 of Table 4,

**Table 4 Rotated Component Matrix and Load of Main Influence Factors**

Index	F1	F2	F3	Contribution Rate β	Load  F β	Load Ranking
V1	0.186	<b>0.9</b>	-0.132	0.21651	0.194859	8
V2	-0.536	-0.593	0.585			
V3	-0.058	0.137	<b>0.979</b>	0.18153	0.177718	9
V4	0.047	<b>-0.909</b>	-0.182	0.21651	0.196808	7
V5	0.439	0.399	-0.714			
V6	0.603	0.565	0.359			
V7	<b>0.818</b>	0.395	-0.199	0.51586	0.421973	4
V8	0.22	<b>0.924</b>	-0.264	0.21651	0.200055	6
V9	0.144	-0.069	<b>0.964</b>	0.18153	0.174995	10
V10	<b>0.969</b>	-0.218	-0.048	0.51586	0.499868	1
V11	<b>-0.942</b>	-0.007	-0.124	0.51586	0.48594	2
V12	<b>-0.808</b>	-0.445	0.26	0.51586	0.41681	5
V13	<b>-0.898</b>	-0.323	0.094	0.51586	0.463242	3

As shown in the table above, the key factors which affect agricultural cold chain logistics vulnerability from the Lord to the times is: Comprehensive Energy Consumption Transport, Storage and Post, Number of Social Welfare Institution, Number of Social Donation, Number of Disputes Mediated, Number of Social Welfare Enterprise, Number of Clients, General Consumption Price Index, GDP of First Industry, Freight Traffic, Total Volume of Waste Gas Discharged.

In which, Comprehensive Energy Consumption Transport, Storage and Post, Number of Clients, Total Volume of Waste Gas Discharged reflect the influence of ethical to agricultural products cold chain logistics vulnerability; Number of Social Welfare Institution, Number of Social Donation, Number of Social Welfare Enterprise reflect the influence of charity; Number of Disputes Mediated reflect the influence of legal compliance; General Consumption Price Index, GDP of First Industry, Freight Traffic reflect the influence of economic contribution to agricultural products cold chain logistics vulnerability.

From the component score coefficient matrix in Table 5, factor score function can be get below:

$$F1 = -0.065 * V1 - 0.045 * V2 + 0.005 * V3 + 0.115 * V4 + 0.039 * V5 + 0.1 * V6 + 0.155 * V7 - 0.064 * V8 + 0.08 * V9 + 0.273 * V10 - 0.245 * V11 - 0.144 * V12 - 0.188 * V13 \tag{1}$$

$$F2 = 0.268 * V1 - 0.102 * V2 + 0.101 * V3 - 0.314 * V4 + 0.043 * V5 + 0.132 * V6 + 0.022 * V7 + 0.265 * V8 + 0.009 * V9 - 0.191 * V10 + 0.105 * V11 - 0.037 * V12 + 0.006 * V13 \tag{2}$$

$$F3 = 0.007 * V1 + 0.151 * V2 + 0.34 * V3 - 0.106 * V4 - 0.208 * V5 + 0.173 * V6 - 0.018 * V7 - 0.036 * V8 + 0.332 * V9 + 0.008 * V10 - 0.077 * V11 + 0.037 * V12 - 0.017 * V13 \tag{3}$$



**Table 5 Component Score Coefficient Matrix**

	Component		
	1	2	3
V1	-.065	.268	.007
V2	-.045	-.102	.151
V3	.005	.101	.340
V4	.115	-.314	-.106
V5	.039	.043	-.208
V6	.100	.132	.173
V7	.155	.022	-.018
V8	-.064	.265	-.036
V9	.080	.009	.332
V10	.273	-.191	.008
V11	-.245	.105	-.077
V12	-.144	-.037	.037
V13	-.188	.006	-.017

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 Component Scores

According to the score of three principal component , using formula( $W=0.56447F1+ 0.23691F2+ 0.19863F3$ ) to calculate the comprehensive scores and vulnerability ranking of six provinces in central, refer to Table 6:

**Table 6 Comprehensive Vulnerability Scores of Six Provinces in Central of China**

	F1	F2	F3	W	Vulnerability Ranking
Hubei	1.08218	-1.26901	-0.55726	0.199528	4
Hunan	0.55487	0.24903	-0.44055	0.284699	2
Jiangxi	-1.54531	-0.62346	-0.91616	-1.20196	5
Henan	0.66251	1.43112	-0.40453	0.632662	1
Shanxi	0.07545	-0.55273	1.79354	0.267893	3
Anhui	-0.8297	0.76504	0.52496	-0.18282	6

The topper of the vulnerability ranking, the more susceptible to interference from external factors which result in system instability. It can be shown from the data analysis that the Anhui Province agricultural products cold chain logistics system is the best, and the capacity of resisting social and economic losses is the most powerful. In contrast, the Henan Province agricultural products cold chain logistics vulnerability degree ranks the highest, the ability of fighting against risks is the lowest. While Hubei ranks the fourth position, which also can guarantee the smooth implementation of the regional agricultural products cold chain logistics. The vulnerability ranking from low to high is: Anhui, Jiangxi, Hubei, Shanxi, Hunan, Henan.

## 5 Conclusion

Reducing the agricultural cold chain logistics vulnerability need the help of the government, the enterprise, and the public three together to make reasonable development planning of the cold chain logistics, to promote the development of cold chain enterprises, and to expand economic contribution degree; when the legal case are improved by the government, the public actively supervise the enterprise

behavior, to promote morality construction; cold chain enterprises should establish good enterprise culture, accelerate the technology updates, pay attention to social ethics, and take part in the public welfare charity, when to improve the ability to resist risks, uniting the whole society force to reduce the harm to the lowest.

As a complex huge system, the agricultural products cold chain logistics system is very complex, involving all respects of stakeholders. In the perspective of social responsibility, the system must assume responsibility for different stakeholders. On that basis ,this paper scientifically divide the vulnerability of the agricultural products cold chain logistics ,and then determine the reasonable and effective evaluation index according to the features of the different dimensions, finally, take the six provinces in Central China as the research objects to make a scientific evaluation on the vulnerability of agricultural cold chain logistics.

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# Empirical Research on China's Regional Innovation Capability Evaluation Based on Factor Analysis\*

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**Abstract:** Regional innovation capability can reflect a region's future development of the core competitiveness. This essay absorbs the advanced experience of index system and pattern established by domestic scholars to establish the systematic evaluation index. Based on factor analysis, the essay analyzes and explains the regional innovation capability of 25 regions in our country and has carried out further analysis and discussion.

**Key words:** Regional innovation capability; Factor analysis; Index system; Core competitiveness

## 1 Introduction

Regional innovation capability refers to the capability that a specific region transfers knowledge into new products, new techniques and new services, applying various reasonable means and resources such as scientific and technological manpower, information, technology, capital, and technological infrastructure<sup>[1]</sup>. Its core is to promote the interaction and mutual connection between innovative institutions, which are reflected as the capability of the contribution to the regional social economic system. The regional innovation capability is one of the decisive factors of the regional competitiveness and has reflected the technological innovation efficiency in a specific region. The evaluation index system of regional innovation capability has experienced the development process from the single index system to the comprehensive index system; especially the application of systematic engineering on regional innovation capability, which has improved the evaluation system of the regional innovation capability.

## 2 Index Establishment

Establishing a reasonable index system is the foundation of the assessment of regional innovation capability. Therefore, different perspectives of index system should have different choices<sup>[2]</sup>. At present, domestic scholars have put up different evaluation indexes of regional innovation abilities, while they have their relative rationality. Li Junhua has constructed the index evaluation system with six primary indexes of the knowledge creation capability, knowledge flow capability, enterprise technology innovation capability, innovation output capability, science and technology innovation investment, science and technological innovation environments and 25 secondary indexes<sup>[3]</sup>. Ceng Qian and Li Fugang have constructed the index evaluation system based on the five aspects of regional innovation environment, knowledge creation and acquisition, regional innovation investment capability, enterprise innovation capability, and innovation profits<sup>[4]</sup>. Wan Yong and Wen Hao have constructed the index evaluation system contain 21 secondary indexes based on the four aspects of region innovation investment, region innovation output, technology diffusion, region innovation environments<sup>[5]</sup>. This essay constructs the index evaluation system with three primary indexes of the innovation investment, innovation output, innovation environments and 18 secondary indexes.

**Table 1 Regional Innovation Evaluation Index System**

Regional innovation evaluation index system	
Primary indexes	Secondary indexes
<b>Innovation investment</b>	Number of region R&D institutions ( $X_1$ )
	Total number of region R&D personnel ( $X_2$ )
	Full-time equivalent of region R&D personnel ( $X_3$ )
	Internal expenditures of region R&D funds ( $X_4$ )

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	Total number of university R&D personnel (X <sub>5</sub> )
	Number of university researchers (X <sub>6</sub> )
	Expenditures of technical renovation of high-technological industry (X <sub>7</sub> )
<b>Innovation output</b>	Number of published research papers (X <sub>8</sub> )
	Number of effective invention patent (X <sub>9</sub> )
	Number of forming the state or industry standard (X <sub>10</sub> )
	Number of published science and technology works (X <sub>11</sub> )
	Percentage of output value of high-technological industries in GDP (X <sub>12</sub> )
	Output value of new products in high-technological industry (X <sub>13</sub> )
<b>Innovation environments</b>	Ratio of high-technological industry import and export trade volume in the total volume of the country (X <sub>14</sub> )
	Index of GDP growth (X <sub>15</sub> )
	Percentage of motor way mileage in the total mileage of the country (X <sub>16</sub> )
	Percentage of railway mileage in the total mileage of the country (X <sub>17</sub> )
	Transaction volume of technology market (X <sub>18</sub> )

### 3 Factor analysis model construction

The name of the factor analysis was firstly put out by Thurstone in 1931. By applying the idea of dimensionality reduction, the factor analysis is a multivariate statistical analysis method that concludes several comprehensive factors from the variables with the complex relationships based the study of the related matrix of original variables

The basic idea of the factor analysis is to find out the real related variables by examining the internal dependent relationships among the numerous variables under the principle of ensuring the least loss of data information and classifies the variables with the relatively strong correlation as one category to form several types of illusion variables, among which different types of variables have weak correlation<sup>[6]</sup>.

The general model of factor analysis is shown in the following formula.

$$\begin{cases} x_1 = a_{11}f_1 + a_{12}f_2 + \dots + a_{1m}f_m + \varepsilon_1 \\ x_2 = a_{21}f_1 + a_{22}f_2 + \dots + a_{2m}f_m + \varepsilon_2 \\ \vdots \\ x_p = a_{p1}f_1 + a_{p2}f_2 + \dots + a_{pm}f_m + \varepsilon_p \end{cases} \quad (1)$$

In the formula,  $f_2, f_1, \dots, f_m$ , ( $m \leq p$ ) are called common factors;  $a_{ij}$  is called factor loading, which reflects the correlation between  $x_i$  and  $f_i$ ;  $\varepsilon_i$  is called special factors, which is the part that can not contained by the previous public factors with the number of  $m$  parts and represents the influence of other factors rather than common factors

## 4 Empirical analysis

### 4.1 Data selection

This essay chooses the relevant data of the innovation abilities in China's 25 provinces to conduct the empirical analysis; the data is taken from China Science and Technology Statistics Yearbook 2011 and China Statistics Yearbook 2011, so the data content is real and reliable. The essay also applies statistical software SPSS17.0 to analyze selected data<sup>[7]</sup>.

### 4.2 Model test

First of all, the model has been tested by KMO and Bartlett, and the result is  $0.712 > 7$ , the result of inspection tests of model are  $0.712 > 7$ , which shows the selected indexes are basically suitable for conducting factor analysis; and the model significance level  $< 0.01$  shows the model inoculation is very good.

**Table 2 Inspection of KMO and Bartlett**  
**Inspection of KMO and Bartlett**

Bartlett sphericity inspection	Sampling sufficient degree of the Kaiser-Meyer-Olkin measure	.712
	Approximate Chi-square	853.405
	df	153
	Sig.	.000

**4.3 Common factors extractions**

By the rotating component matrix and gravel figures, we can know there are three eigenvalues. Therefore, the sample is divided into three components, among which the contribution rates of three factors are 58.578%, 15.347% and 8.976% respectively[8].

**Table 3 Total Variance Explained**  
**Total variance explained**

Compositions	Initial Eigenvalues			Loading extraction squares	
	Total	Variance %	Accumulation %	Total	Variance %
1	10.544	58.578	58.578	10.544	58.578
2	2.762	15.347	73.925	2.762	15.347
3	1.616	8.976	82.901	1.616	8.976
4	.852	4.732	87.633		
5	.630	3.502	91.135		
6	.503	2.793	93.929		
7	.443	2.458	96.387		
8	.325	1.803	98.190		
9	.165	.917	99.108		
10	.079	.437	99.545		
11	.050	.276	99.821		
12	.014	.081	99.902		
13	.007	.040	99.941		
14	.004	.022	99.963		
15	.003	.018	99.981		
16	.003	.015	99.997		
17	.000	.003	99.999		
18	.000	.001	100.000		

Extraction method:principal analysis

**4.4 Factor classification**

**Table 4 Rotating Composition Matrix**  
**Rotating composition matrix**

	Compositions		
	1	2	3
Number of region R&D institutions (X <sub>1</sub> )	.859	.149	.286
Total number of region R&D personnel (X <sub>2</sub> )	.976	.077	-.150
Full-time equivalent of region R&D personnel (X <sub>3</sub> )	.978	.064	-.152
Internal expenditures of region R&D funds (X <sub>4</sub> )	.953	.078	-.204
Total number of university R&D personnel (X <sub>5</sub> )	.828	.424	.068
Number of university researchers (X <sub>6</sub> )	.811	.415	.048

Expenditures of technical renovation of high-technological industry (X <sub>7</sub> )	-.008	.852	.127
Number of published research papers (X <sub>8</sub> )	.973	.050	-.139
Number of effective invention patent (X <sub>9</sub> )	.975	.072	-.171
Number of forming the state or industry standard (X <sub>10</sub> )	.949	-.026	-.214
Number of published science and technology works (X <sub>11</sub> )	.912	.243	-.010
Percentage of output value of high-technological industries in GDP (X <sub>12</sub> )	.256	.884	-.162
Output value of new products in high-technological industry (X <sub>13</sub> )	.163	.848	.115
Ratio of high-technological industry import and export trade volume in the total volume of the country (X <sub>14</sub> )	.117	.460	-.342
Index of GDP growth (X <sub>15</sub> )	-.552	-.268	-.321
Percentage of motor way mileage in the total mileage of the country (X <sub>16</sub> )	-.163	.354	.791
Percentage of railway mileage in the total mileage of the country (X <sub>17</sub> )	-.125	-.393	.747
Transaction volume of technology market (X <sub>18</sub> )	.951	.109	-.215

Extraction method: principal component analysis. Rotation method: orthogonal rotation method with Kaiser standardization

Shown in Rotating ingredients matrix, Composition 1 covers the indexes such as number of region R&D institutions (X<sub>1</sub>), total number of region R&D personnel (X<sub>2</sub>), full-time equivalent of region R&D personnel (X<sub>3</sub>), internal expenditures of region R&D funds (X<sub>4</sub>), total number of university R&D personnel (X<sub>5</sub>), number of university researchers (X<sub>6</sub>), number of published research papers (X<sub>8</sub>), number of effective invention patent (X<sub>9</sub>), number of forming the state or industry standard (X<sub>10</sub>), number of published science and technology works (X<sub>11</sub>), and transaction volume of technology market (X<sub>18</sub>), which are called developmental factors. The three factors of expenditures of technical renovation of high-technological industry (X<sub>7</sub>), percentage of output value of high-technological industries in GDP (X<sub>12</sub>), and output value of new products in high-technological industry (X<sub>13</sub>) contained in Composition 2 are called technology factors. Composition 3 contains two factors of percentage of motor way mileage in the total mileage of the country (X<sub>16</sub>) and percentage of railway mileage in the total mileage of the country (X<sub>17</sub>), which are called environment factors.

#### 4.5 Comprehensive evaluation results of region innovation for each region

Table 5 Composition Scoring Coefficient Matrix

Composition scoring coefficient matrix

	Compositions		
	1	2	3
Number of region R&D institutions (X <sub>1</sub> )	.114	-.023	.224
Total number of region R&D personnel (X <sub>2</sub> )	.104	-.040	-.027
Full-time equivalent of region R&D personnel (X <sub>3</sub> )	.105	-.045	-.028
Internal expenditures of region R&D funds (X <sub>4</sub> )	.098	-.036	-.061
Total number of university R&D personnel (X <sub>5</sub> )	.075	.084	.080
Number of university researchers (X <sub>6</sub> )	.072	.083	.067
Expenditures of technical renovation of high-technological industry (X <sub>7</sub> )	-.056	.296	.042
Number of published research papers (X <sub>8</sub> )	.107	-.050	-.020
Number of effective invention patent (X <sub>9</sub> )	.103	-.041	-.040
Number of forming the state or industry standard (X <sub>10</sub> )	.104	-.072	-.064
Number of published science and technology works (X <sub>11</sub> )	.093	.018	.046
Percentage of output value of high-technological industries in GDP (X <sub>12</sub> )	-.046	.299	-.115

Output value of new products in high-technological industry ( $X_{13}$ )	-.036	.283	.046
Ratio of high-technological industry import and export trade volume in the total volume of the country ( $X_{14}$ )	-.043	.167	-.216
Index of GDP growth ( $X_{15}$ )	-.069	-.040	-.219
Percentage of motor way mileage in the total mileage of the country ( $X_{16}$ )	.007	.106	.449
Percentage of railway mileage in the total mileage of the country ( $X_{17}$ )	.064	-.159	.455
Transaction volume of technology market ( $X_{18}$ )	.094	-.025	-.069

**Extraction method: principal component analysis. Rotation method: orthogonal rotation method with Kaiser standardization**

## 5 Conclusion

From the result analysis, we can know that the development factors have huge influence on regional innovation capability; for this kind of factors include many hardware conditions for regional innovation, such as personnel, capitals, patented technology, etc. From the scores, due to many high teaching-quality universities and their human resource factors, Beijing has constructed the strong foundation of regional innovation, which is not only the national innovation leader, but also the core strength of national innovation.

Scores of technology factors in Jiangsu province and Guangdong provinces are similar, in the leading position in China. Because of the establishment and development of these high-tech industrial parks in these regions, the promotion of the innovation capability of high-tech enterprises will definitely drive the development of regional innovation, which will create benign circulation and promote the training and increase of regional innovation.

Generally speaking, China regional innovation capability is still strong in the east region and weak in the west, which distributes from the eastern coastal areas to the west inland areas and from high to low as a ladder. Although the regional innovation capability in the western region has improved with the pace of developing the western region, the regional innovation capability still maintain the obvious negative position compared with that in the east area. Therefore, the development of western region should be focused on optimizing economic structures and developing Characterized Industry so as to enhance the effective demand of regional innovation from the social and economic development. Based on the advantage of the regional innovation system, we can narrow the gap between east and west, which could improve our country's whole innovation capability.

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# Impact of Financial Support on Economic Development of Export-Oriented Entities: A Case of Xinjiang Horgos Economic Development

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**Abstract:** This paper uses the inductive analysis and comparison analysis method, from the support of Economic Development Zone Horgos export-oriented economic development entities significance to begin, analysis of the economic development zone finance development present situation, put forward extroversion economy to develop the problem of existence, combining with the problems such as how to support financial export-oriented economic development entities, using the method of theory analysis, the financial support of Horgos extroversion economy development policy recommendations.

**Key words:** Finance; Innovation; Export-oriented real economy; Development

## 1 Introduction

Horgos Economic Development Zone lies on the intersection of the two economic belts, that is, the Asian-Pacific region under rapid development and the Single European Market, gifting it the important passage on the European-Asian land transportation, meanwhile neighboring the Mid-Asian region with abundant resources and huge market potential. The studies carried out by the foreign academic and research institutions focus on the operation condition of the Sino-Kazak Horgos International Economic Cooperation Center and the regional economic cooperation under the Shanghai Cooperation Organization, etc<sup>[1]</sup>, especially on the running of the Sino-Kazak Horgos International Economic Cooperation Center; most research institutions consider that the strengthening of economic cooperation between Xinjiang and Mid-Asian countries is the need for double-winning development. The huge resources and wide consumption market space of the Mid-Asian countries are eager for exploration, while the jointly-developed kernel projects between the Parties make their cooperation prospect wider and wider.

While the domestic academic and research institutions pay attention to the self construction and development of Horgos Economic Development Zone after permitted to implement special policies, and special researching attentions are paid to the construction of Horgos exported products assembly and processing base, imported and exported products distributing center, logistic passage and international commercial and trading center; meanwhile relevant researches are undertaken on the advantages and future development orientation of the Horgos Economic Development Zone; while the studies on the Horgos' export-oriented economy under the support of finance are much fewer.

The dissertation will utilize the inductive analysis and comparative analysis to problems existing in the export-oriented real economy development of the Horgos Economic Development Zone in details so as to find out the policy advices on the Horgos' export-oriented real economy development supported by finance. Innovative researches are implemented to support the export-oriented real economy development in the development zones from such aspects as financial organization system, promotion of Renminbi internationalization, multi-channel financing, financial products and services innovation, talent introduction.

## 2 Meanings to support export-oriented real economy development of Horgos Economic Development Zone

Horgos Economic Development Zone lies on the west end of the 312th National Highway, Lianyungang-Horgos Highway, Longhai-Lanxi Railway, neighboring the Mid-Asian region with abundant resources and huge market potential; it is the important passage for the European-Asian land transportation, also the international passage and bridgehead of the economic and cultural exchange between China and Mid-Asian countries, even Europe.

The Central Working Conference on Xinjiang held in 2010 pointed out, "making full use of unique location advantage of the European-Asian Land Bridge, establishing an economic development zone at



Kashi and Horgos respectively, implementing special economic policies, so as to build it into the window of the China's westward opening and the new growth point of the Xinjiang economy", moreover, the Horgos Economic Zone is positioned as exported product assembly and processing base, imported and exported product distributing center, logistic passage and international commercial and trading center. "Advices On Supporting The Construction of Horgos Economic Zone" (GUOFA[2011] No. 33) issued by the State Council on September 30, 2011 makes the strategic disposition of the development zone construction from seven aspects, that is, strategic positioning, general requirements, fundamental rules, regional scope, industrial layout, supporting policies, organization and leadership. All of these gift the Horgos' construction and development with the golden opportunity. Facing the uncommon historical opportunity, it poses important meanings towards the great-leap-forward development of the development zone to speed up the development of financial industry at the Horgos Economic Development Zone, to support the export-oriented real economy development.

1) Sino-Kazak International Border Cooperation Center, an cross-border economic cooperation zone jointly-constructed by China and Kazakhstan, is the first cross-border economic and trading cooperation center in China established in 2006 permitted by the State Council; since its commencement in 2007, 880 million yuan of accumulative infrastructure investments from China has been achieved. The first six commercial projects in the cooperation center constructed by China were commenced formally on May 25, 2011, total investment arrives at 10.8 billion yuan. The Sino-Kazak Horgos International Border Cooperation Center was put into synchronous operation between China and Kazakhstan on July 1, 2011. As the demonstration zone of regional cooperation under the framework of the Shanghai Cooperation Organization, the Cooperation Center will become the important supporter of China's westward opening strategy<sup>[2]</sup>.

2) Horgos is the passage of the Line 2 of "Natural Gas Transmission from West To East", Mid-Asian Natural Gas Pipeline Project; currently a 30 billion cubic meter of annual natural gas supply agreement has been signed between Turkmenistan and China, and the first phase Sino-Turkmenistan natural gas pipeline project began to operation in 2009, double-line was put into operation in 2010, and 30 billion cubic meters natural gas will be provided formally; the continuous strengthening and extension of these agreement and cooperation projects make Horgos' special geographic position rise to a key strategic position. In 2009, natural gas from Mid-Asia entered China from Horgos successfully, pushing the development of export and import trades of Horgos firmly.

3) As a development zone implementing special economic policies, Horgos will become the international transportation junction facing the Mid Asia, even Europe, and another bridgehead in the Western China, with the completion of Jinghe-Yining-Horgos Railway, the connection of Sino-Kazak highways and the completion of the Mid-Asian natural gas pipelines; it will play more and more important role in the process of connecting the east and west<sup>[3]</sup>.

Horgos has become the third international trading passage of China facing the Mid Asia and Europe with over ten million tons of goods passage following Manzhouli and Alashankou. Supporting export-oriented real economy development of the Horgos Economic Development Zone will highlight its roles of bridgehead, big junction and big passage, which poses important meanings to speed up the steps of outwards opening of development zone, to speed up the development of road economy<sup>[4][5]</sup>. to blend into Mid-Asian regional economic cooperation gradually and to promote economic growth of Xinjiang province of China.

### **3 Economic and Financial Development Status of Horgos Economic Development Zone**

In 2010, Horgos Economic Development Zone has realized 3.0 billion yuan of regional GDP, increased by 33.6% than the last year; 10.50 million tons of import and export goods, increased by 242%; 7.0 billion dollars of import and export trade volume, increased by 135%, thereinto, total export is 2.5 billion dollars, increased by 25.9%; total import is 4.5 billion dollars, increased by 334.8%; port's entry-exit personnel arrives at 0.82 million person.time, increased by 50%.

Currently there are six financial institutions, that is, Industrial & Commercial Bank of China, Agricultural Bank of China, Bank of China, China Construction Bank, Postal Savings Bank Horgos Branch and Horgos Rural Credit Cooperative, establishing its branches at the development zone. The four state-owned commercial banks have opened international businesses one after another in the development zone, even provided foreign-exchange deposits, foreign exchange loans, foreign currency exchange, international settlement, forex sale and purchase business and several other foreign exchange

financial services for firms and individuals in accordance with the development of foreign trades. Main trading settlement types include cash settlement of exchange, telegraphic transfer, letter of credit, letter of guarantee, etc. Financial institutions in banking business in development zone have handled 887 billion dollars of various cross-border settlement businesses in 2011, including 676 million dollars of cash settlement in dollar under border export trade items. With the rapid increase in Renminbi settlements, the inflow of Tenge, the currency of a neighboring country, continues increasing, however, no banks in the development zone have not carried out exchange business between Renminbi and Tenge, so only folk Tenge cash exchange occurs.

#### **4 Problems Existing in Serving Export-Oriented Real Economy Development**

(1) Whether financial service function can meet the need of export-oriented real economy development. Currently the serve system of financial institutions in development zone is relatively single, state-owned commercial banks dominate the financial institutions, and all of banking branches are county or even below levels of institutions, resulting in narrower business and operation scope, limited operation and management authority, fewer financial service types, simple service forms, and limited ability in financial services for export-oriented real economy development. Currently the setting of financial institutions in development zone, along with their service ability, fails meeting the financial requirements for long-term development in export-oriented real economy from the aspect of financial supply.

(2) Lack of risk sharing mechanism in export-oriented real economy. It reflects mainly in the following aspects: firstly, lack of financing assurance service system, no financing assurance institution established in the development zone, becoming the bottleneck of bank supporting enterprise's development; secondly, lack of export credit insurance system; thirdly, no "green passage" custom supervision assurance system established by the third party financial institutions in the form of credit insurance.

(3) Lots of factors constraining the development of Renminbi settlement business in cross-border trades. Currently the recognition of Kazak firms and citizens towards Renminbi is still much lower, resulting in not too stronger depositing willingness, along with not enough Renminbi deposits in Kazakhstan. There is no Tenge settlement business occurred under Sino-Kazak trading items, neither Chinese nor Kazak firms open Tenge settlement accounts at the banks in the development zone. Meanwhile, since there is no platform and clearing system for local currency trades between Chinese and Kazak banks, and no direct settlement occurs between Renminbi and Tenge; USD is still used for forex crossing and forex buying or selling business in actual operation. Normal bidirectional cross-border cycling mechanism cannot be established in short term for Renminbi capital, constraining the development of Renminbi cross-border business in much wider fields in development zone.

(4) Not too smooth financial exchange channels in Sino-Kazak bordering area. There is no efficient communication and exchange channels between financial institutions in the connecting area between the development zone and Kazak borders, China's financial institutions cannot grasp the Kazak financial policies, along with custom supervision policies relevant to cash cross-border transit, meanwhile lack disseminating and introducing China's channels of local currency settlement, inter-bank account opening, banking funds settlement and currency exchange as stipulated by policies to the Kazak financial institutions timely, that is, efficient communication and exchange mechanism has not yet established, so no efficient communication and negotiation are implemented in financial cooperation affairs between the Parties, causing difficulties in connection with relevant business.

#### **5 Advices on Supporting Export-oriented Real Economy Development**

Making full use of finance's serving, safeguarding and guiding functions towards economic development, formulating financial industry development programming for the development zone as soon as possible, taking the financial industry as an important industry standing on the functional positioning of the development zone so as to supporting it to become bigger and stronger. Firstly, issuing fiscal supporting policies towards financial industry, organization costs allowance and tax exemption will be gifted to various financial institutions introduced newly into the development zone; secondly, transformation of current state-owned commercial banks from single-point branch to comprehensive subsidiary should be realized to perfect branch layout and to improve functional layer and integral servicing ability, loan examination and business innovation authority should be delegated to lower levels to establish authorization system suitable for the development of the development zone;

thirdly, lowering entry criteria to support the new organization of Sino-foreign joint-funded banks, rural banks, loans corporation, trust and investment banks, financial leasing companies, financial companies, securities companies and insurance companies, etc. in the development zone so as to form the financial institution organization system with complete varieties, reasonable function division, complementary functions, complete competition and standardized actions to improve the capital allocation ability and financial service ability of the development zone.

Promoting the ability of finance supporting export-oriented real economy development fundamentally to form a financial service pattern with diversified financing channels. Firstly, implementing differentiated loan management methods. Promoting each headquarter and branch of all commercial banks to formulate special loan policies and financial service policies actively, and formulating loan marketing strategies and cultivating efficient loan demand surrounding the development strategies of the development zone combined with the development zone's industrial policies. Key inclination on loan scale should be gift to the development zone, along with "division" examination and assessment implemented separately. Meanwhile credit approval authority should be extended to the banks in the development zone, along with the widening of requirements for bad loan assessment indexes for the banking institutions in the development zone, efficient increase in loan investment in development zone, and strengthening of loan's support towards key industries, industrial transfer and acceptance, industrial layout, etc. in the development zone; secondly, establishing perfect multi-layer financing guarantee service system, endeavoring the state funding to establish policy financing guarantee companies actively, encouraging the development of commercial financing guarantee institutions and inter-firm mutual financing guarantee organizations so as to form good bank-guarantee firm cooperation relationship and to solve the bottleneck of financing; thirdly, extending financing channels actively, making full use of inter-bank markets, capital markets and insurance markets to extend direct financing business, realizing multi-channel financing by issuing corporate bonds, short-term financing bills, mid-term notes, stocks and other financial market instruments. Encouraging listed companies inside and outside Xinjiang invest their financed funds into the projects in the development zone. Encouraging and supporting the securities institutions, stock holding investment firms, etc. inside and outside Xinjiang to enter the development zone to carry out businesses, creating service environment helpful for the healthy development of venture investments and intermediary institutions.

Carrying out reform testing points in the development zone regarding goods trades, service trades and forex management under capital items actively, promoting Renminbi's exchangeability under capital items, trying best to early testing and implementation of forex-related financial policies in the development zone. Advising the banks to open the settlement accounts between Renminbi, Tenge and exchangeable currencies for foreign firms and individuals engaged in foreign trades, and handling their account collection and paying, forex purchasing and selling in accordance with relevant stipulations. Strengthening the promotion force of Renminbi cross-border business by the firms in the development zone even further. Improving Renminbi settlement volume in export and import trades, and investment in transaction with the Mid-Asian countries, promoting Renminbi's localization at Kazakhstan and other Mid-Asian countries so as to realize the healthy cross-border recycling of Renminbi funds. Encouraging foreign firms to use Renminbi in direct investments in the development zone, encouraging the firms in this area to use Renminbi in direct foreign investment.

The financial institutions in the development zone should improve their product competitiveness and overall financial service level, so as to provide good financial services for the export-oriented real economy. Firstly, much force should be made to the development of new products, special and directional financial product innovation and regionalized financial product development should be made, and regionalized and individualized financial products should be promoted in accordance with the condition of regional markets and similar businesses; attentions to be paid to the increase of safe, convenient, and cheap credit product and service, so as to lower firms' financing and trading costs; secondly, providing consultation services, such as, macroeconomic policies analyses, international economic position changes, industrial trend and latest market information to the firms actively. Improving firms' financial management consciousness through publicity and training, helping firms to choose proper financial products and to lower funding costs; thirdly, guiding exporting firms to avoid forex risk actively, guiding them to strengthen risk management consciousness, establishing risk management cost ideas, helping firms to choose foreign trade settlement currency reasonably so as to lower the losses from forex changes; fourthly, providing close financial consultation services for the firms, guiding the firms to be engaged in swaps, hedging, value maintenance and cost locking operations

for monetary funds, product export and raw material import, helping firms to make good use of financial instruments to lower financial risks.

Export-oriented real economy development requires not only perfection of relevant systems, implementation of product innovation, introduction of funds and technologies, but, more important, the cultivation and introduction of high-end financial talents. Therefore, to adapt the demand for financial talents from the Horgos export-oriented real economy development, firstly, the financial talents' training mechanism of all financial institutions at locality must be perfected, guiding all financial institutions in the development zone to strengthen the cooperation with professional training institutions and colleges, to implement various and diversified re-education training so as to improve the professional quality of local financial employees continuously; secondly, establishing long-term high-end financial talent introduction mechanism with the correspondently-aiding-Xinjiang provinces and cities in the new round of corresponding aiding Xinjiang works, introducing talents from the corresponding provinces and cities; thirdly, introducing and selecting excellent financial talents from home and abroad, creating good working, studying and living conditions for the financial talents seeking for development opportunities in the development zone; fourthly, formulating detailed and feasible talent stimulation mechanism to prevent talent losses, exploiting the high-end talent abstraction strategy in the form of technological investment so as to promote them rooting in this area.

With the relevant economic and financial preferential policies of the economic development zone as the absorption force, strengthening the logistical infrastructure construction and investment force, encouraging the relevant investors and firms home and abroad to invest in logistical infrastructures; building export product assembly and processing base, import and export product distribution center, great logistical passage and international commercial and trading center in the near future: processing base must connect with the industrial transfer in the eastern area, therefore to transfer the eastern advanced technology and introduce talent and labors; the development of the import and export product distribution center can bring opportunities for the port logistical development, bringing along the development of transportation and the productive services, meanwhile playing radiation role to stimulate the economic development in the surrounding countries; while the commercial and trade center can increase the opportunities of goods choice for the consumers so as to absorb more and more export-oriented entities to participate the commercial activities in the development zone. Meanwhile, much attention must be paid to the logistical information resource sharing to improve the logistical information management level and logistical service level<sup>[6]</sup>. The completion of these infrastructures can bring abundant capital flow, information flow, commercial flow and technological flow for the development zone, so as to provide a healthy operation and development environment for the export-oriented economy development in the development zone.

Xinjiang has the ingrown geographic advantages because its surrounding countries are most the members or the observer states of the Shanghai Cooperation Organization. Among the members of the SCO, Kazakhstan and China share 1782 km bordering line; in economy, Kazakhstan positions the leading position in the Mid-Asian region, with much higher economic opening degree and stronger regional cooperation consciousness. Horgos Economic Development Zone must make full use of the neighboring relation with Kazakhstan and the opportunity of running of Sino-Kazak Horgos International Border Cooperation Center to establish Sino-Kazak bordering financial communication and meeting mechanism under the framework of the Shanghai Cooperation Organization so as to provide better development opportunity for the development zone's export-oriented economy development. Firstly, from the macro aspect, establishing financial communication and exchange mechanism between the national, Autonomous Region governments and the Kazakhstan, carrying out timely negotiation and discussions on financial cooperation, strengthening mutual confidence and exchange, promoting smooth running of trades; secondly, from the micro aspect, the special custom administration institutions should strengthen the exchanges with the special Kazak institutions, establish electronic information platform facing the Mid-Asian markets to reduce or avoid trade conflicts; thirdly, establishing the financial regular joint-meeting mechanism under the Sino-Kazak Cooperation Center participated by the financial office under the local government, the People's Bank of China, banking bureau, custom and frontier inspection department, discussing the problems existing in the trade settlement and financial cooperation, negotiating the solution methods so as to arrive at common advices then reported to each country for approval then implementation.

## 6 Conclusions:

The research of the dissertation concludes the main advices on the Horgos' export-oriented real economy development supported by finance, that is, firstly, perfecting financial supporting policies and financial organization system; secondly, forming multi-channel financing financial service framework; thirdly, promoting Renminbi trade and investment settlement actively; fourthly, focusing on developing financial products and service innovation; fifthly, cultivating and introducing high-end financial talents actively; sixthly, speeding up the construction of Horgos Macro-Logistical Center, commercial and trading center; seventhly, establishing financial communication and meeting mechanism under the SCO cooperation framework.

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# Research on the Evaluation of College Innovation and Entrepreneurship Education Based on Fuzzy Analytical Hierarchy Process<sup>\*</sup>

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**Abstract:** Innovation and entrepreneurship education is an important way to train a large number of high-quality talents with innovative and entrepreneurship capability in the new era, so there is important significance to evaluate the Innovation and entrepreneurship education quality of higher education institution scientifically, which can help to promote the healthy development of Innovation and entrepreneurship education in China. This paper expounds the definition of Innovation and entrepreneurship education at first, structures the index system and gives a evaluating method based on Fuzzy Analytical Hierarchy Process (FAHP), and carries out a case analysis finally, which can offer theoretical and practical guidance for the development of Innovation and entrepreneurship education of higher education institution in China.

**Key words:** Innovation education; Entrepreneurship education; College; Fuzzy comprehensive evaluation; Analytic hierarchy process

## 1 Introduction

As an educational pattern in knowledge economy era, innovation and entrepreneurship education refers to a kind of new-type educational idea and mode, with the goal of training the high-quality talents with innovative consciousness, innovative thinking, innovative ability and innovative personality in the new era, which helps college students to establish the innovative consciousness, excite innovative spirit, grasp the innovative knowledge and improve innovative ability through various channels such as school, government and enterprise. Innovation and entrepreneurship education originated from U.S.A. at first, which developed innovative education energetically through the measures such as opening the courses of innovation and entrepreneurship education covering the middle and high school, university and graduate, setting up innovative research center etc.. As to the innovation and entrepreneurship education in China, it is still at starting and trial stage, which has not formed a systematic pattern and evaluating system of innovation and entrepreneurship education. Therefore, this paper regards innovation and entrepreneurship education as the target, structures a scientific evaluation index system of innovation and entrepreneurship education, and gives a evaluating method based on Fuzzy Analytical Hierarchy Process, which offers a scientific evaluating method to perfecting the innovation and entrepreneurship education system and pushing the development of innovation and entrepreneurship education in China.

## 2 The Framework of Index System

As an educational systematic project operated cooperatively by various organizations such as a government, school and society, etc., innovation and entrepreneurship education involves the contents of education and teaching, practice platform, teachers' team, social supporting etc., so there are numerous factors influencing innovation and entrepreneurship education. On the basis of analyzing the definition of innovation and entrepreneurship education and the results of previous studies in an all-round way, this paper proposes the framework of index system of evaluating the innovation and entrepreneurship education quality, which includes four dimensions of government, university, society and student, as shown in Table. 1.

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**Table 1 The Index System of College Innovation and Entrepreneurship Education Evaluation**

Target	First-class Indexes	Second-class Indexes
Evaluation of College Innovation and Entrepreneurship Education (A)	Government dimension ( $B_1$ )	Fund input $B_{11}$
		Management organization and system $B_{12}$
		Policies and preferential measures $B_{13}$
	University dimension ( $B_2$ )	School-running concept and planning $B_{21}$
		Curriculum system establishment $B_{22}$
		Teachers team $B_{23}$
		Campus cultural environment $B_{24}$
		Educational facilities and practice base $B_{25}$
	Social dimension ( $B_3$ )	Social reputation $B_{31}$
		Social atmosphere $B_{32}$
		Enterprise group $B_{33}$
	Student dimension ( $B_4$ )	Scientific research ability $B_{41}$
		Innovation achievement $B_{42}$
		Entrepreneurship rates $B_{43}$
		Practice activities $B_{44}$

### 2.1 Government dimension

The government plays an increasingly important role of leading and supporting in innovative education. The government dimension mainly includes such factors as leading students to innovate actively by increasing the fund input, issuing the relevant policies and preferential measures, establishing special educational management organization and making the corresponding management system measures, for instance issuing tax allowance or credit financing policies.

### 2.2 University dimension

As the subject of implementing the innovation and entrepreneurship education, higher education institutions are the main organizations and place to implement the innovation and entrepreneurship education, so the universities are the main strengths of innovation and entrepreneurship education. University dimension mainly includes that the school makes positive school-running concept and planning of innovation and entrepreneurship education, establishes the special management organization and management system of innovation and entrepreneurship education, fosters the outstanding teachers team of innovation and entrepreneurship education, sets up the rational course system and content, increase input to build educational facilities and practice base, builds a good atmosphere of innovation and entrepreneurship education in the whole school and even the whole society.

### 2.3 Social dimension

The society is the strong support of innovation and entrepreneurship education, it includes social reputation and social atmosphere mainly, namely the identification of the society on innovation and entrepreneurship education, and the good innovation atmosphere built by the whole society. In addition, public organizations and enterprises should support university students to innovate actively, and offer energetical service and support for them, for instance they can offer practice base to the students.

### 2.4 Student dimension

Students are the target of innovation and entrepreneurship education. Innovation and entrepreneurship education aims at improving students' innovation ability and fostering the high quality talents meeting the development of knowledge-driven economy era, so students' behavior is a direct expression of the innovation and entrepreneurship education quality. The student dimension includes students' scientific research ability, innovative achievement, entrepreneurship rates, and the performance participating in practice activities of the innovative education, such as scientific research number, the number of times, scientific findings, innovative work, performance participated and rewarded in the contests etc..

## 3 Evaluation Model of FAHP

Both Analytic Hierarchy Process (AHP) and Fuzzy Comprehensive Evaluation (FCE) has its own pros and cons(Guo, 2005; Yang, 2000), this paper uses two methods of AHP and FCE synthetically to

propose a new method of Fuzzy Analytic Hierarchy Process (FAHP) ( McCaffrey, 2007), We adopt the method of Fuzzy Analytic Hierarchy Process (FAHP) to carry on the evaluation of innovation and entrepreneurship education evaluation quality of higher education institution, the procedures are as follows:

**3.1 Establish the evaluation index system**

We should establish the evaluation index system of innovation and entrepreneurship education at first. According to the analysis of the evaluating target, we set up a rational and scientific evaluation index set of innovation and entrepreneurship education as shown in Table1.

**3.2 Confirm the weight of the index**

Now we use the Analytic Hierarchy Process (AHP) to confirm the weight of each index. Firstly, construct the judging matrix according to T.L.satty graduation theory ( Saaty, 2008). Secondly, confirm the weight of every layer of indexes.

**3.3 Confirm the comment set**

We carry on the grade judgment to the index according to the quality level of the target, namely the comment set  $V = (v_1, v_2, \dots, v_5)$ , it can be defined five grades,  $V =$ ( good , little good , medium , little bad , bad).

**3.4 Set up the fuzzy matrix**

We set up the fuzzy evaluating matrix  $R$  as follows:

$$R = \begin{bmatrix} R_{11} & R_{12} & \dots & R_{1n} \\ R_{21} & R_{22} & \dots & R_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ R_{m1} & R_{m2} & \dots & R_{mn} \end{bmatrix} \tag{1}$$

Among them,  $R_{ij}=(i=1,2,\dots,m;j=1,2,\dots,n)$  means the subordinate degree of index  $R_i$  to the  $V_j$  comment.

**3.5 Construct the fuzzy comprehensive evaluation model**

According to the synthetic operation rule of fuzzy matrix, the comprehensive evaluation model  $A$  is:

$$A = W' \cdot R = (A_1, A_2, \dots, A_n) \tag{2}$$

If  $\sum A_i \neq 1, A' = (A'_1, A'_2, \dots, A'_n), A'_j = A_j / \sum A_j, (j = 1, 2, \dots, n)$

**3.6 Confirm the score set**

Suppose  $K = (K_1, K_2, \dots, K_n)^T, N$  means the series of comment set,  $K_i$  refers to the score of  $i$  comment , regard 100 as the full marks,  $K_i = i \times 100 / n (i = 1, 2, \dots, n) .$

**3.7 Calculate and evaluate the results**

$B = A \times K$  or  $B = A' \times K$ , which is the score of the appraising target. Then we can appraise the quality of innovative education according to the value of  $B$ . The evaluation may be divided into five levels, as shown in table 2.

**Table 2 Result evaluation of the quality of innovative education**

$B$ value	[0~60)	[60,70)	[70,80)	[80,90)	[90,100]
comment set	Bad	little bad	medium	little good	Good

**4 Examples**

**4.1 The choice of the example**

As one of high educational institutions in China, Wuhan University of Technology pays great attention to the cultivation of student's innovation ability and the construction of the innovative education system. This research will use the above method of Fuzzy Analytic Hierarchy Process (FAHP) to carry on the evaluation of innovation and entrepreneurship education evaluation quality of Wuhan University of Technology.

**4.2 The evaluation procedure of the example**

The concrete procedure is as follows:

- 1) Establish the evaluation index system of innovation and entrepreneurship education as shown in Table 1.
- 2) Confirm the weight of every index with AHP. Firstly, construct the judgment matrix of the



indexes in *B* layer, as shown in Table 3.

**Table 3 Judgment matrix of the indexes in *B* layer**

A	<i>B</i> <sub>1</sub>	<i>B</i> <sub>2</sub>	<i>B</i> <sub>3</sub>	<i>B</i> <sub>4</sub>
<i>B</i> <sub>1</sub>	1	1/3	5	3
<i>B</i> <sub>2</sub>	3	1	7	5
<i>B</i> <sub>3</sub>	1/5	1/7	1	1/3
<i>B</i> <sub>4</sub>	1/3	1/5	3	1

Secondly, confirm the weight of all the indexes in *B* layer:

$$W_B = (0.2634, 0.5638, 0.0550, 0.1178)^T$$

In a similar way, we can get the weight of secondary index layer:

$$W_{B_{1j}} = (0.6370, 0.1047, 0.2583)^T$$

$$W_{B_{2j}} = (0.0421, 0.2606, 0.5015, 0.0649, 0.1309)^T$$

$$W_{B_{3j}} = (0.6370, 0.2583, 0.1047)^T$$

$$W_{B_{4j}} = (0.1175, 0.5650, 0.2622, 0.0553)^T$$

3) Confirm the comment set. It is divided into five grades, *V* = {good (>90), little good (80~90), medium (70~80), little bad (60~70), bad (<60)}.

4) Set up fuzzy evaluating matrix. According to the investigation and mark of 10 experts, we get the calculation sheet of fuzzy evaluation of secondary index layers as shown in Table 4.

**Table 4 The calculation sheet of fuzzy evaluation**

Factor layer			Secondary factor layer			Evaluating grade				
<i>i</i>	<i>B</i> <sub><i>i</i></sub>	<i>W</i> <sub><i>i</i></sub>	<i>j</i>	<i>B</i> <sub><i>ij</i></sub>	<i>W</i> <sub><i>ij</i></sub>	<i>V</i> <sub>1</sub>	<i>V</i> <sub>2</sub>	<i>V</i> <sub>3</sub>	<i>V</i> <sub>4</sub>	<i>V</i> <sub>5</sub>
						Fuzzy matrix				
						good	little good	medium	little bad	bad
1	<i>B</i> <sub>1</sub>	0.2634	1	<i>B</i> <sub>11</sub>	0.6370	0	0	0.4	0.6	0
			2	<i>B</i> <sub>12</sub>	0.2583	0	0.6	0.4	0	0
			3	<i>B</i> <sub>13</sub>	0.1047	0	0.4	0.4	0.2	0
2	<i>B</i> <sub>2</sub>	0.5638	1	<i>B</i> <sub>21</sub>	0.1309	0	0.4	0.6	0	0
			2	<i>B</i> <sub>22</sub>	0.5015	0	0.2	0.6	0.2	0
			3	<i>B</i> <sub>23</sub>	0.0649	0	0.4	0.6	0	0
			4	<i>B</i> <sub>24</sub>	0.2606	0	0	0	0.4	0.6
			5	<i>B</i> <sub>25</sub>	0.0421	0	0.6	0.4	0	0
3	<i>B</i> <sub>3</sub>	0.0550	1	<i>B</i> <sub>31</sub>	0.0194	0	0	0	0.8	0.2
			2	<i>B</i> <sub>32</sub>	0.0277	0	0	0	0.4	0.6
			3	<i>B</i> <sub>33</sub>	0.0450	0	0.4	0.6	0	0
4	<i>B</i> <sub>4</sub>	0.1178	1	<i>B</i> <sub>41</sub>	0.1175	0.2	0.2	0.4	0.2	0
			2	<i>B</i> <sub>42</sub>	0.5650	0.2	0.4	0.4	0	0
			3	<i>B</i> <sub>43</sub>	0.2622	0	0.6	0.4	0	0
			4	<i>B</i> <sub>44</sub>	0.0553	0	0	0.6	0.4	0

5) Construct the fuzzy comprehensive evaluation model. According to  $A = W^T \cdot R$ , the result is normalized as follows:

$$A_{B_{1j}} = W_{B_{1j}}^T \cdot R_{B_{1j}} = (0.2914, 0.3967, 0.1936, 0.1183, 0)$$

$$A_{B_{2j}} = (0.0736, 0.2556, 0.3564, 0.2144, 0.1000)$$

$$A_{B_{3j}} = (0.0681, 0.1682, 0.2291, 0.3501, 0.1845)$$

$$A_{B_{4j}} = (0.1105, 0.2846, 0.3637, 0.2412, 0)$$

So the subordinated vector of *B* is as follows:

$$R_B = \begin{bmatrix} A_{B_{1j}} \\ A_{B_{2j}} \\ A_{B_{3j}} \\ A_{B_{4j}} \end{bmatrix} = \begin{bmatrix} 0 & 0.1969 & 0.4000 & 0.4031 & 0 \\ 0 & 0.2039 & 0.4352 & 0.2045 & 0.1564 \\ 0 & 0.0180 & 0.0270 & 0.0266 & 0.0205 \\ 0.1365 & 0.4068 & 0.4111 & 0.0456 & 0 \end{bmatrix}$$

The comprehensive evaluation model:

$$A = W_B^T \times R_B = (0.0161, 0.02157, 0.4006, 0.2283, 0.0893)$$

The normalized result is:  $A' = (0.0169, 0.2271, 0.4217, 0.2403, 0.0940)$ .

(6) Confirm the score set:  $K_1=20, K_2=40, K_3=60, K_4=80, K_5=100$ , so  $K=(20,40,60,80,100)^T$ .

(7) Calculate and evaluate the results. According to  $B = A' \times K$ , we can get the calculation results is:  $B=63.348$ .

### 4.3 Analysis of the results

The above-mentioned result indicates that Wuhan University of Technology is relatively poor in the quality of innovation and entrepreneurship education. As a suggestion, Wuhan University of Technology should increase the input and support into innovation and entrepreneurship education and strengthen the cooperation with various aspects, in order to improve the quality level of innovation and entrepreneurship education.

## 5 Conclusion

On the basis of expounding the definition of innovation and entrepreneurship education, this research structures the index system from four dimensions of government, university, society and student at first, and then gives a evaluating method based on Fuzzy Analytical Hierarchy Process, finally takes Wuhan University of Technology for an example to test the above method. This research can offer theoretical and practical guidance for the development of innovation and entrepreneurship education of higher education institution in China. However, there are still several places needing to be improved in this research, and the index system still need to be revised constantly in the future work.

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## Research on Radiation Scope of Service Industry in Main China Cities

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**Abstract:** With the higher and higher proportion of service industry in the national economy, it is becoming an important industry in support of the city's regional radiation effect. This paper, based on "Breaking point" model in city radiation theory, selected 19 major cities in China as the research object, built the service industry comprehensive strength index system, analyzes the differences in service industry comprehensive strength of these cities, drew weight Voronoi diagram of these cities' service industry radiation scope, concluded that the size of city's service industry radiating scope does not conform to its radiation capacity, due to difference in location.

**Key words:** Service industry; Radiation capacity; Radiation scope; Main cities

### 1 Introduction

Industry is the source of urban radiation. Since 1960s the services has gradually become an important engine of economic growth, the world showing a trend of transformation of the industrial economy to a service-oriented economy (the so-called service economy refers to the services accounted for more than 60% in GDP). Value added services has reached 69.4 percent share of global GDP, in 2009. United States, Britain, Germany and Japan and other developed countries have entered into service economy. Changes in industrial structure, also lead to changes in the composition of the urban radiation. Service industry is becoming the future core support of the city's radiation force. With the upgrade of industrial structure in China, the radiation capacity of Chinese city is more and more determined by the services.

Zhang Yun<sup>[1]</sup> (2010) studied the radiation capacity of Beijing's producer services. Pang Yi<sup>[2]</sup> (2010) studied the radiation of distribution services in Beijing. Zhang Hui<sup>[3]</sup> (2010) studied the radiation of Beijing's financial service industry. However, at present, only few researches are on services radiation or radiation scope of the other cities in China. This paper will draw on the radiation model, comparative study on the composition and size of the service industry radiation of China's major cities, and the cities' radiation scope. This study will be conducive to depth understanding of the regional economy radiation capacity constitute, it is also conducive to the find the hinterland or service area of service industry.

### 2 Radiation Model

The division of the urban hinterland is an important part of the study of urban geography. Initially, according to five indicators including the flow direction of the rail commuters, newspaper publishers range, phone swap direction, as well as to office locations of the person in charge in companies and banks, H L Green (1989) estimates the average boundary between New York and Boston, and then integrated the theoretical boundary between the two cities. After investigation of a large number of U.S. cities during 1929-1931, and learn from the physics of Newton "gravity" theorem, W J Reilly proposed the "law of retail gravitation" (also known as "Reilly's law") to determine the scope of the retail area. "Reilly's law" gradually be applied to the measure of the mutual attraction between the city, the law says that the attraction between two cities is proportional to the scale of the two, and is inversely proportional to the distance between them. Developed the theory of Reilly, P D Converse put forward the concept of "Breaking Point" and gives the calculation method in 1949. "Breaking Point" has been defined as the point between adjacent cities, where the attractions of these two cities have reached the balance, and calculated as follows:

$$d_A = D_{AB} / (1 + \sqrt{P_B / P_A}) \quad \text{or} \quad d_B = D_{AB} / (1 + \sqrt{P_A / P_B})$$

In the formula,  $A$  and  $B$  represents a different city,  $D$  refers to the distance between city  $A$  and  $B$ ,  $d$  is the distance of the "Breaking Point" to each city,  $P$  means the population of each city. According to the basic formula of the theoretical breaking point, you can get the following three inferences.

Corollary 1: the sum of the distance of "Breaking Point" to the two adjacent cities equals to The Euclidean distance between the two cities. The formula is:

$$d_A + d_B = D_{AB}$$

Corollary 2: the distance of “Breaking Point” to the city, is proportional to the square root of the city’s center intensity values. The formula is:

$$\frac{d_A}{d_B} = \frac{\sqrt{P_A}}{\sqrt{P_B}}$$

Corollary 2: in homogeneous flat region, the expansion rate of city’s radiation is proportional to the square root of the city’s center intensity values. The formula is:

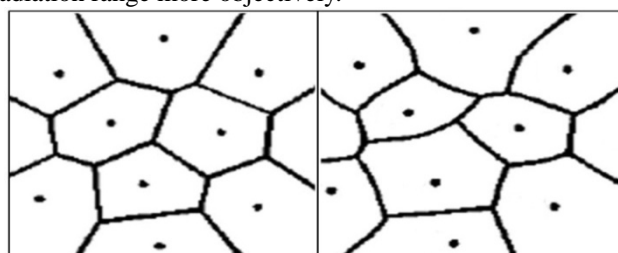
$$\frac{v_A}{v_B} = \frac{\sqrt{P_A}}{\sqrt{P_B}}$$

In practical use, breaking point theory can well determine city's radiation area, but there are still some flaws, mainly in: First, in the theory of the breaking point, the city radiation determined only by the urban population, which does not fully reflect all aspects of the city’s radiation capacity; Second, the breaking point theory can only be used to calculate a breaking point of two adjacent cities, but the reality is that the breaking point of the two cities should be a curve constituted by countless breaking point, and the reality of urban space distribution is complex, the breaking point can not accurately determine the true scope of radiation cities.

For the first shortcomings of “Breaking Point” theory, scholars at home and abroad are trying to build the city's comprehensive strength evaluation system involved in a variety of indicators, instead of a single indicator of population. For the second shortcomings of “Breaking Point” theory, scholars use the Voronoi diagram to draw the map of urban radiation range.

Voronoi diagram is one way of space subdivision. It was invented in 1908 by the Russian mathematician Voronoi. In regular Voronoi diagram, given control points  $P_i (i = 1, 2, \dots)$  in homogeneous plane is the growth nuclear, the growth nuclear expand outwards at the same rate until no gap constitutes in the space, the expansion area of all the control points are polygons some except external control points. An important property of the Voronoi diagram is that the distance from each point of the Voronoi grid to the grid’s control point is shorter than to any other grid’s control points. So Voronoi diagram can be used in the division of urban radiation by this feature.

Weighted Voronoi diagram is a commonly used form of Voronoi diagram. Different from regular Voronoi diagram, in weighted Voronoi diagram, the outward expansion rates of each point are not equal, but equal to the weight of each point. That is  $v_A/v_B = \lambda_A/\lambda_B$ ,  $v$  is the expansion speed,  $\lambda$  is the weight of each control point. Give each control point the same weight  $\lambda_A = \lambda_B$ , then  $v_A = v_B$ , so we get normal Voronoi diagram. In reality, weighted Voronoi diagram has been widely used, and can determines the urban radiation range more objectively.



A. Normal Voronoi diagram      B. Weighted Voronoi diagram  
**Figure 1      Voronoi Diagram**

Scholars have used “Breaking Point” and Voronoi diagram to study the radiation range of the city or of the city’s service industry. Boots & South<sup>[4]</sup> (1997), used higher order multiplicatively weighted Voronoi polygons to determine the mall service area and service area of the bus station. Pearce<sup>[5]</sup> (2000) used ordinary Voronoi diagram and weighted Voronoi diagram to determine service area of schools. Japanese scholars Okabe<sup>[6]</sup> (1997) and Suzuki<sup>[7]</sup> (1997) used Voronoi diagram to study facility location optimization problems on different levels in continuous flat space, and verify Chris Taylor’s city center theory in Urban Geography. Wang Xinsheng<sup>[8]</sup> (2000) explored the application of the Voronoi diagram to define the impact scope of economic object space in Hubei Province. LU Yuqi<sup>[9]</sup> (2001) constructed the index system, to calculate each city's comprehensive strength, and determined the impact area of 11 cities in Hebei Province. Wang Guiyuan<sup>[10]</sup> (2004) used “Breaking point” model, field strength model

and the Voronoi diagram to explore the city forces circles based on GIS.

### 3 Service Industry Comprehensive Strength Evaluation

#### 3.1 Index system and data

The service industry output value cannot represent its comprehensive strength, so we evaluate service industry comprehensive strength from aspects of consolidated basis, industrial scale, industrial structure and development potential. Consolidated basis can reflect the market size (urban scale), the economic base (economic level) for service industry development. Industrial scale is evaluated from the absolute value and proportion of the production and employment scale. Industrial structure, as industrial high-end level is evaluated by the state of development of the logistics and financial industries. Development potential refers to the expected future of service industry, can be evaluated mainly by the level of the city's human resources, technology and capital. Then we constructed the index system of 22 indicators.

As China has so many cities, we have chosen 19 major cities as a research object, they are sub-provincial cities or municipalities, which plays an important role in national economic development. This data are from the 2011 Statistical Yearbooks of each city, with reference to the provinces' Statistical Yearbooks, China Statistical Yearbook, Yearbook of China's urban in 2011. Of particular note, the data is in 2010, except R & D in 2009. Standardizing data through maximum - minimum value method, empowered 22 indicators through entropy method, then we can get the following table 1.

**Table 1 Indicators and Weights**

A	B	C
Consolidated basis (0.220)	Urban scale (0.083)	Population (0.042)
		Jurisdiction area (0.041)
	Economic level (0.137)	GDP(0.044)
		Industrial added value (0.042)
		Per capita GDP (0.050)
Industrial scale (0.255)	Production scale (0.173)	Services added value (0.048)
		Service industry of GDP (0.038)
		Services added value of per capita (0.045)
		Services value added of unit land (0.042)
	Employment scale(0.083)	Services employees (0.045)
		Services employees proportion (0.038)
Industrial structure (0.305)	Financial industry (0.139)	Balance of deposits (0.044)
		Balance of deposits/loans (0.048)
		Premium income (0.048)
	Logistics industry (0.166)	Total cargo (0.050)
		Total passenger (0.056)
		Mail service (0.060)
Development potential (0.220)	Human resources (0.087)	Number of college and university(0.048)
		Number of students in college and university (0.040)
	Technology (0.088)	R&D (0.041)
		Year patent applications (0.046)
Capital(0.045)	Fixed investments to service industry(0.045)	

#### 3.2 Evaluation and comparison

On standardizing the data and calculate the score of each index, we can get the score and ranking of these cities in services strength in the following table 2.

As can be seen from table 2, all indicators show a great difference in different cities. 4 cities ranked very front in all indicators, they are Beijing, Shanghai, Guangzhou and Tianjin. This shows that the basis, size, structure, and potential of the city's service industry are all very high. For a long time in the future, other cities cannot go beyond them. Some cities in the top surface, has one indicator ranked behind, such as Shenzhen, Chongqing, Chengdu, Wuhan, Hangzhou and Nanjing. This means that, a short board exist, which is the key factor in the further development of urban services. One indicator of Dalian, Ningbo

and Xi'an ranked front, as overall score ranked far behind. This means they have good potential in the development of service industry, but the potential has not yet translated into strength. Shenyang, Qingdao, Jinan, Harbin, Xiamen, Changchun ranked very behind in all indicators. These cities are all distributed in the northern region, except Xiamen, showing that service industry of north China is lagging behind South China.

**Table 2 Score and Ranking of 19 Major Cities' Service Industry Comprehensive Strength**

City	Consolidated basis		Industrial scale		Industrial structure		Development potential		Overall	
	score	ranking	score	ranking	score	ranking	score	ranking	score	ranking
Beijing	0.120	3	0.224	1	0.261	1	0.211	1	0.815	1
Shanghai	0.157	1	0.178	2	0.226	2	0.163	2	0.725	2
Guangzhou	0.109	4	0.144	4	0.151	5	0.091	3	0.495	3
Shenzhen	0.109	5	0.146	3	0.170	3	0.055	12	0.480	4
Chongqing	0.121	2	0.042	17	0.156	4	0.076	6	0.394	5
Tianjin	0.102	6	0.086	5	0.078	7	0.086	5	0.351	6
Chengdu	0.051	14	0.065	9	0.111	6	0.074	7	0.301	7
Wuhan	0.055	12	0.075	7	0.052	10	0.086	4	0.269	8
Hangzhou	0.084	7	0.068	8	0.054	8	0.059	10	0.265	9
Nanjing	0.054	13	0.076	6	0.053	9	0.062	9	0.244	10
Dalian	0.068	9	0.049	15	0.033	13	0.051	14	0.202	11
Shenyang	0.058	11	0.056	12	0.030	14	0.054	13	0.199	12
Ningbo	0.080	8	0.039	18	0.045	11	0.031	17	0.195	13
Xi'an	0.025	18	0.051	14	0.037	12	0.070	8	0.183	14
Qingdao	0.065	10	0.056	13	0.029	15	0.032	16	0.181	15
Jinan	0.041	16	0.065	10	0.018	16	0.057	11	0.180	16
Harbin	0.051	15	0.046	16	0.013	17	0.044	15	0.154	17
Xiamen	0.023	19	0.061	11	0.004	19	0.007	19	0.095	18
Changchun	0.037	17	0.023	19	0.005	18	0.025	18	0.090	19

#### 4 Service Industry Radiation Scope

Radiation scope of each city's services industry is not only determined by its comprehensive strength, but also related to factors such as distribution, transportation, topography and administrative jurisdiction of the city. So, we use the weighted Voronoi diagram to analyze actual situation of radiation scope of each city's services, and assuming that the city is located in the homogeneous plane. The weight of each city is the square root of service industry comprehensive strength score.



**Figure 2 Radiation Scope of 19 Major Cities' Service Industry in China**

According to figure 2, we can directly compare the size of the service industry radiation of the cities. We adjusted the radiation area as the city is the smallest unit. If the city on the border, most of its administrative jurisdiction is in the radiation area of city A, then it belongs to A's radiation. When different cities take the same proportion of the border city's administrative jurisdiction, we think that the border city belongs to the radiation area where the administrative center in.

**Table 3 Area of 19 Major Cities' Service Industry Radiation Scope Unit:  $10^3 \text{ km}^2$**

City	Area	City	Area	City	Area	City	Area
Beijing	3855.4	Tianjin	62.8	Dalian	13.2	Jinan	131.8
Shanghai	137.1	Chengdu	2138.4	Shenyang	163.2	Harbin	456.9
Guangzhou	549.3	Wuhan	360.7	Ningbo	19.2	Xiamen	84.3
Shenzhen	62.8	Hangzhou	134.9	Xi'an	325.9	Changchun	84.4
Chongqing	769.8	Nanjing	143.4	Qingdao	51.6		

From table 3 may safely draw some conclusions. First, Beijing is the national services center. Beijing's services radiating area covers vast regions from the northeast to the northwest, north to central China's. This is consistent with the National Center for Beijing. Second, Shanghai is under intense competition. Although Shanghai's service industry has a strong comprehensive competitiveness, its radiation area is small, thanks to the competitive effect of neighboring cities. Third, Chengdu, Chongqing, Guangzhou are regional services center cities. Services range of radiation of these cities is most extensive after Beijing. Forth, radiation of most cities' service industry is only in their province or territory, such as Tianjin, Hangzhou, Nanjing, Ningbo, Shenzhen, Wuhan, Xi'an, Jinan, Qingdao, Shenyang and Harbin. Fifth, the radiation area of some cities is very small, such as Tianjin, Dalian, Changchun, Ningbo and Xiamen.

## 5 Conclusion

There is a big gap between China's major cities in the development of service industry. City in economically developed areas, such as Beijing, Shanghai, Guangzhou and Shenzhen, its service industry is more developed than of the city in centre and west China. As its different locations, radiation scope of the its services industry is not only determined by comprehensive strength. The size of its radiating area does not conform to its radiation capacity. The city in east China is strong in service industry comprehensive strength, small in radiation area. The city in west China is limited in service industry comprehensive strength, but broad in radiation areas. The city in central and northeast China is relatively balanced in these two areas. This also indicates that, east China has higher services radiation intensity, as west China has lower services radiation intensity.

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# An Empirical Study on the Regional Competitiveness of the Xijiang Economic Belt

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**Abstract:** Now, the subject of the economic competition has been transferred from a single city to a combination of multi-city. Xijiang economic belt as a focus on building the economic region of Guang Xi, its development is undoubtedly plays a very important role in autonomous regions' development, therefore, to promote a better development of Xijiang economic belt, It is necessary to carry out the evaluation of regional competitiveness. This paper uses the AHP to analyze the relative regional competitive elements. Design a rational regional competitiveness evaluation index system according to the actual situation of the Xijiang economic belt. Finally, according to the Institute of the conclusions, Put forward concrete proposals to enhance the competitiveness of Xijiang economic belt, and accelerate the achievement of the goal of the Xijiang economic belt rising from the west.

**Key words:** Regional competitiveness; Xijiang economic belt; Analytic hierarchy process; Index system

## 1 Introduction

"Xijiang economic belt" is the concept of regional economic blocks, including some areas in Guangxi, Guangdong, Yunnan and Guizhou provinces of China, Guangxi holds whole economic with 80% of the area. According to 《Xijiang economic belt development plan》, Guangxi Xijiang economic belt including 8 Cities: Nanning, Guilin, Liuzhou, Wuzhou, Guigang, Laibin, Baise, Chongzuo.

The Xijiang shipping trunk and the Yangtze River Known as the "golden water way", It is an important part of southwest China Water way passage to the other counties. As a national strategy with the development of Guangxi Beibu Gulf Economic Zone, Guangxi Zhuang Autonomous Region Party Committee and the government have made a major decision "to build the West River golden water way" strategy. Its core task is to adjust and optimize the economic structure and industrial layout, to promote regional economic be more coordinated and sustainable. After the State Council approved the Guangxi Beibu Gulf Economic Zone Development Plan, The Xijiang has been taken as a coordinating economic development strategic decision in Guangxi region in the new era.

October 28, 2009, The State Council executive meeting discussed and adopted the report of "a number of views on further promoting economic and social development in Guangxi ". And this report point out that The economic and social development in Guangxi in the future strategic task is to cultivate Guangxi Beibu Gulf Economic Zone and the Xijiang Economic Belt as the leading role, to improve the industrial layout and logistics base, advanced manufacturing base, special agriculture base and information exchange center, Fully reflects the development and construction of the Xijiang economic belt has entered national decision-making horizons.

## 2 Methodology

### 2.1 Index selection principle

Factors affect the development of regional competitiveness are different. Thus, the selected indicators are relatively complicated. In order to be more accurately and reasonably reflect the development of regional competitiveness, the selection of indicators must follow some certain principles.

#### 1) The integrity principle

Regional competitiveness is a holistic concept, we must to compare the entire region rather than one aspect, so, the selected indicators must reflect the overall regional competitiveness.

#### 2) The operability principles

In the process of designing regional competitiveness evaluation index system, specific index selection is restricted by many factors. In the index system, there may be some indicators can not be included in. Therefore, in the index selection process, It must take full account of the data operability principles, to give up the data indicates which are unable to obtain. Alternative or choose an easily accessible data indicators with similar indicators.



3)The representative principle

There are numerous actors that affect regional competitiveness, all the elements have been selected as study factors can be more accurate to draw conclusions absolutely, but this will undoubtedly increase the difficulty of the study, and therefore we select only in the choice of indicators can be to a greater extent behalf of the host indicators of regional competitiveness.

**2.2 Index selection and hierarchical structure**

According to the competitiveness evaluation index system which commonly used in IMD and WEF, and combined with the actual situation of the Xijiang economic belt to build competitiveness evaluation index system of the Xijiang economic belt, the system including six regional competitiveness factors, select the representative 33 specific indicators, as shown in table 1.

**Table 1 The main competitiveness indicator**

		The first grade indicator	The second grade indicator		
Regional Competitiveness	A1 Economic Strength (0.2284)		A11 GDP		
			A12 Investment in fixed assets		
			A13 Revenue		
			A14 GDP growth rate		
			A15 Revenue growth rate		
			A16 Growth rate of investment in fixed assets		
			A17 The growth rate of per capita GDP		
			A11 GDP		
			A12 Investment in fixed assets		
			B1 Industrial Competitiveness (0.1870)		B11 Proportion of the two industry value
					B12 Key enterprises
					B13 Proportion of the three industry value
			C1 International Competitiveness (0.1531)		C11 Total value of import and export commodities
					C12 Import and export growth rate
					C13 Actual utilization of foreign investment
					C14 Growth of the actual utilization of foreign capital
					C15 Foreign direct investment
	C16 The number of international passengers				
	D1 Infrastructure&Environmental management (0.1531)		D11 Graded highway mileage		
			D12 Postal and Telecommunication Services		
			D13 Highway freight volume		
			D14 Waterway Freight volume		
			D15 Telephone penetration rate		
			D16 Number of Internet users		
			D17 Waste water treatment facility		
			D18 Domestic sewage discharge		
	E1 Human Resource competitiveness (0.1531)		E11 The number of health institutions staff		
			E12 Number of hospital beds		
			E13 Institutions of Higher Education		
			E14 College level population ratio		
			E15 Number of College Students		
			E16 Total population		
	F1 Science &Technology competitiveness (0.1253)		F11 Number of science and technology person		
F12 Science and technology market turnover					
F13 Number of Enterprises of the national high-tech industries					

### 2.3 Empirical Study on Regional Competitiveness

#### 1) Data source and the calculation of evaluation index weights

Considering the Authority and availability of information, take the data of the "Guangxi statistical yearbook", "Guangdong statistical yearbook", "Liaoning statistical yearbook" and "Chinese urban statistical yearbook" in 2010 as a foundation, mining the individual data from the China Economic and Social Development Statistical. The ultimate target data come from the sum of all cities' data in economical belt, and have been normalized to get the standard data.

According to the Statistical Yearbook data and the expert survey results, paired comparisons are made with judgments using numerical values taken from the AHP absolute fundamental scale of 1 to 9, then, construct the evaluation index judgment matrix, however, in the process of constructing the judgment matrix, the judgment matrix does not always meet the consistency test, also, the rough estimate with a certain blindness, when the number of N (Evaluation indicators) becomes larger, this cross judge would lead to contradictions, in order to improve the consistency of judgment matrix and reduce the work, this article using the following algorithm:

Set any one judgment matrix  $A=(a_{ij})_{n \times n}$ , the first row elements of A matrix :  $a_{11}, a_{12} \dots a_{1n}$ , Relatively importance of row elements were given by the experts, and then to determine the links between the elements. In order to avoid cross judgments between the various elements, the following algorithm can prevent the emergence of contradictions. Set the Transformation matrix  $B=(b_{ij})_{n \times n}$ , Assuming there are any two elements in the first row of A matrix  $a_{ij}$  and  $a_{ik}$  ( $j=1, 2, 3 \dots n-1; k=3, 4, 5 \dots n, j < k$ ), then  $a_{jk}$  determination algorithm is as follows:

Step 1: Compute the two elements of transformation matrix B which corresponds with  $a_{1j}$ , and  $a_{1k}$ , that is, if  $a_{1j} > 1$ , then the  $b_{1j} = a_{1j}$ ; otherwise  $a_{1j} < 1$ ,  $b_{1j} = 2-1 / a_{1j}$ . If  $a_{1k} > 1$ , then the  $b_{1k} = a_{1k}$ ; otherwise  $a_{1k} < 1$   $b_{1k} = 2-1 / a_{1k}$ .

Step 2: compute the transformation matrix B  $b_{jk} = b_{1j} \cdot b_{1k}$ .

Step 3: Calculate the elements  $a_{jk}$  of judgment matrix A , if  $b_{jk} > 0$ , then  $a_{jk} = 1 / (1 + b_{jk})$ ; otherwise the  $b_{jk} < 0$ , the  $a_{jk} = 1 + |b_{jk}|$ .

Generally speaking, the smaller of CR (consistency test indicators), the better of the consistency of judgment matrix, if the CR  $< 0.1$ , judgment matrix has satisfied consistency, in accordance with the above algorithm to construct the judgment matrix and solving the weight W of each index ,as shown in Table 2, Table 3.

**Table 2 Level indicators weights**

	A1	B1	C1	D1	E1	F1	weights
A1	1	2	3	3	3	4	0.2284
B1	1/2	1	2	2	2	3	0.1870
C1	1/3	1/2	1	1	1	2	0.1531
D1	1/3	1/2	1	1	1	2	0.1531
E1	1/3	1/2	1	1	1	2	0.1531
F1	1/4	1/3	1/2	1/2	1/2	1	0.1253

$$\lambda=5.135 \quad CR=CI/RI=0.029<0.1$$

**Table 3 Index comparison and analysis of weight in competition ability of Xijiang,Liaoning and PRD**

Index of Level 1	Index of Level 2	Weights	XEB	LEB	PRD
A1 (0.2284)	A11	0.2509	4602.14	6950.45	32147.00
	A12	0.1377	37357335	54504731	76912909
	A13	0.1264	6705500	14389673	22810000
	A14	0.1264	13.34%	12.45%	10.63%
	A15	0.1160	11.7%	10.28%	7.5%
	A16	0.1300	10.34%	9.45%	8.62%
	A17	0.1127	12.12%	14.63%	8.74%
B1 (0.1870)	B11	0.3256	39.98%	50.70%	50.26%
	B12	0.2494	238	346	2246
	B13	0.4251	27.78%	37.19%	46.64%

C1 (0.1531)	C11	0.2410	800154	24000567	55805590
	C12	0.1973	7.06%	10.45%	9.87%
	C13	0.1511	53485	776621	1644367
	C14	0.1511	7.78%	10.45%	10.6%
	C15	0.1511	84979	776621	1766684
	C16	0.1083	102.98	147.08	616.47
	C11	0.2410	800154	24000567	55805590
D1 (0.1531)	D11	0.1275	40497	31635	49612
	D12	0.1374	4542600	4169063	29834800
	D13	0.1481	45139	49789	96859
	D14	0.1275	3275	9676	30343
	D15	0.1097	82.23%	87.32%	90.67%
	D16	0.1097	1548285	2471275	3875643
	D17	0.1125	384	771	996
	D18	0.1275	77494	52853	48969336
E1 (0.1531)	E11	0.2012	140348	115006	343977
	E12	0.1395	83047	81374	135314
	E13	0.1821	72	50	97
	E14	0.1647	60.78%	65.66%	81.65%
F1 (0.1253)	F11	0.2923	182738	183216	1165515
	F12	0.4983	41362	1306811	2358949
	F13	0.2094	963	1757	3695

(XEB:Xijiang economic belt; LEB:Liaoning economic belt; PRD:Pearl River Delta)

### (2) Regional competitiveness evaluation and results

After determining each index weights and removing the indicator data dimensionless, taking a comprehensive evaluation and calculating the final score of the three economic regions. The weighted sum of multi-index comprehensive evaluation model is based on the actual situation of the Xijiang economic belt. During the comprehensive evaluations, the calculation of Target strata, criterion layer and the index layer would compose the weighted summation model. The formula is as follows.

$$Q = \sum_{m=1}^l I_m W_i$$

Where  $I_i$  and  $W_i$ , respectively, Represent the next level of evaluation of the index values and the corresponding weight.

## 3 Results

Under the above way, comparing the region competitiveness among the Xijiang economic belt, Liaoning's economy belt and the Pearl River Delta region, calculating the evaluation results as follow in Table 4.

**Table 4 Regional competitiveness evaluation results**

Evaluation index	XEB	LEB	PRD
A1	0.3104	0.3104	0.3792
B1	0.2494	0.3256	0.4251
C1	0.2279	0.2976	0.4745
D1	0.3114	0.3328	0.3558
E1	0.3104	0.3104	0.3792
F1	0.2693	0.3289	0.4018
Regional competitiveness	0.2802	0.3176	0.4022

Because the population, economy, culture, location conditions in the three regions are quite different, resulting in the three regions are obvious advantages and disadvantages of each sub factor. We can be seen through the above analysis and the final score: Pearl River Delta Regional with

competitiveness score of 0.4022, the highest score in three regions; Liaoning economic belt with regional competitiveness score of 0.3176, ranked second in the three regions; Xijiang economic belt with regional competitiveness score of 0.2802, the weakest among the three. The analysis is divided into the following aspects from the individual factors.

## 4 Conclusion and countermeasures

### 4.1 Result analysis

#### 1) Comprehensive economic strength.

From the analysis, we can know that the Xijiang economic belt and the Liaoning economic belt developed in a same step, the Pearl River Delta obtain the highest scores. In fact, the actual situation of the Pearl River Delta based on the total economic base in the PRD, which in the AHP analysis will weaken its actual competitiveness. On the other hand, the Xijiang economic belt and the Liaoning Economic Belt has the advantage compared to the Pearl River Delta.

#### 2) Industrial competitiveness.

Pearl River Delta in industrial competitiveness factor have a distinct advantage, In the sub factors of industrial competitiveness can be seen that the PRD can keep a huge advantage is benefited by it's higher proportion of tertiary industry as well as in the large number of key enterprises and a relatively good business environment.

#### 3) International competitiveness.

From the table in the comparison of international competitiveness, can be seen that the Xijiang economic belt and the Liaoning economic belt at the same level, Liaoning's major international trading partner are South Korea, Japan and other developed countries, the international competitiveness of Xijiang economic belt is more rely on the trade with the ASEAN countries. Nevertheless, Xijiang economic belt still have a huge gap between the Liaoning and the Pearl River Delta. Pearl River Delta, with its traditional port and coastal advantages in the international arena are more competitive.

#### 4) Technological competitiveness.

At the point of the technological competitiveness, the Xijiang economic belt owns an obvious gap from the PRD, Because there is a large scale of 211 Universities in the Pearl River Delta region, what is more, the number of universities and the highly educated persons in the PRD are more than the Xijiang economic belt, while the well known university in the Xijiang economic belt is only one, at the same time, the economic strength and the attractive wages would be recognized as the major causes to attract talents in the Coastal cities. So, the West economic belt to build its own excellent comprehensive university and improve staff wages is a major method to enhance its scientific and technological competitiveness.

#### 5) The environment and infrastructure.

In the environment and infrastructure construction, the Xijiang economic belt's water emissions is the least in three regions, only one third of the Pearl River Delta, half of Liaoning, This shows two problems: First, The industry of the Pearl River Delta is much larger than the Xijiang economic belt and the economy of Liaoning. Secondly, Xijiang economic belt of the Environmental Protection, natural resources persecution is significantly less than the other two places.

#### 6) Competitiveness of human resources.

Comparison of the human resources, the population of the Xijiang economic belt is more than the Liaoning economic zone, below the Pearl River Delta, but the per capita wage of the Xijiang economic belt is more affordable compared to other two places, this allows companies to reduce labor costs in the Xijiang economic belt, improve regional competitiveness of enterprises. However, the Xijiang economic belt is still far lagged behind the Pearl River Delta in demand for high-end talent.

### 4.2 Countermeasures

According to the competitiveness evaluation results and the affective factors in this article, some recommendations they would be made as the follows:

( ) The government should improve the investment environment and streamline the verification process, at the same time, to improve the transparency of government decision-making. First of all, Because of the capacity of attracting foreign investment in the Xijiang economic belts is weak, so, it is necessary to strive to get rid of market entry barriers, streamlining unnecessary verification link and improve the transparency of government decision-making, what is more, strengthen the open market discipline, create a fair, transparent and efficient public manage environment and enhance the investment confidence of enterprises should be take as the important measures to be carried out;

Secondly, In order to further improving the infrastructure construction in Guangxi, the key point is to take the Xijiang as the basis, develop a regional hub port, formatting an easily accessible, complete facilities of water and land transportation network, and further establish the sea's export status in the southwest of China

( ) Encourage exports, develop the market of international demand. The cities of Xijiang have coastal location advantage, under the premise of strengthening complementarities of cooperation with ASEAN countries, industry should continue to participate in the ASEAN market and make efforts to strengthen their competition. Further increasing the Guangxi product market share with Vietnam, Thailand, Indonesia, Singapore and other neighboring countries, at the same time, we must try to reverse the export market for the distribution of concentration, avoid regional risk situation ,open up new market areas and promote the layout export market by unitary steering diversified. Use of international standards to guide the industry's innovation in a wide range of international competition, and enhance the international competitiveness of industry.

3) Vigorously develop tourism and port services in Guangxi rich tourist resources and natural advantages are the basis for the development of tourism in Xijiang economic belt, which to bring a effective change about the overall competitiveness of the Xijiang economic belt, But we should also see the Xijiang economic belt is rich in tourist resources, but does not translate into actual tourism product. What is more, district development is highly uneven, ranging from the tourism industry is highly developed and high profile tourist city Guilin to there are many rich tourism resources, but has not yet been developed city Wuzhou. This is not only a waste of the rich tourism resources and the national culture, but also restricts the depth of the region's tourism development. Therefore, the Xijiang should take tourism as a whole region characteristic industry to operate.

4) Establish a flexible and effective personnel training mechanisms. Further increasing investment in education and reinforcing the foundation of education to encourage a variety of market demand for vocational education, so as to improve the overall quality of labor. Strengthening the introduction of professional scientific and technical personnel, especially the introduction of the academic leaders of the regional industrial development; Active contact with the coastal developed area, like Hong Kong, MaCao and other developed countries, to carry out technical exchanges and personnel training, introduce regional competitive industries required high-level personnel around the world, and continuously improve the quality of local professionals, promote the construction of science and technology team.

5) Building a just, vibrant and sustainable regional science and technology policy, actively introduce high-tech and technical personnel to effectively guide capital flows, the government also should pay more efforts to develop high value-added products. Gradually make Guangxi's large and medium sized enterprises set up technology development center, And developed with independent intellectual property rights of technology and products. Taking the technology as the center, at the same time, considering the organization of technical development as the main body, to build technical innovation development system. Take the tertiary institutions and research institutes as the main technical support, promote the combination of production, education and research. Further to improve the multi channels and levels science and technology investment system to ensure that science and technology funding steady growth. Establishing science and technology development fund to support the transformation of the major scientific and technological achievements. Adopt preferential policies to encourage and guide enterprises to increase investment in science and technology. Finally, to enable enterprises to become the main body of investment of science and technology.

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# Study of the Dynamic Relationship Between China's Industrial Structure and Economic Growth

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**Abstract:** With the economic development, industrial structure continues to evolve, it has become a hot issue of macroeconomic research what causal relationship between them. Based the 1978-2010 macroeconomic datum, use the unit root test, cointegration test and Granger causality test, to analyze the relationship between China's industrial structure and economic growth. From the Study, we find that long-run equilibrium cointegration relationship exists between the China's industrial structure and economic growth, and shows an obvious stage characteristics and trends, the first industry is more dependent on economic growth, which is nurturing role in promoting process, the secondary industry has always maintain a close relationship with economic growth, the tertiary industry has gradually become an important engine for future economic growth.

**Key words:** Industrial structure; Economic growth; Cointegration analysis; Granger causality test

## 1 Introduction

Based on the traditional competitive equilibrium economic growth theory that the market competition can maintain the balance between supply and demand in the long run, so the production has been "Pareto optimality", which means that the marginal revenue of the same factors of production of the various branches of production are equal, so the study of economic growth, there is no need to consider the flow and transfer of resources between the departments. In this case, the factors that cause economic growth are confined to the capital accumulation and labor growth and technological progress. Until the 1960s, scholars have adopted the statistical analysis of historical data for many countries with economic growth and industrial structure, and pointed out that the economic structure is one of the variables that affect economic growth.

Kuznets<sup>[1]</sup>(1957) compared with empirical data of 50 countries, the number of the manufacturing sector will increase to be accompanied by the growth of per capita income.Chenery<sup>[2]</sup>(1960)used the empirical data of 51 countries with the elements of decision analysis sector growth shows that when a country's economic scale change, service industries and agriculture changes minimally, and manufacturing growth, which made the pattern of industrial growth and that this industrialization model enables resources to be the optimal configuration.Pasinetti<sup>[3]</sup>(1981) saw an economic system as a series of vertically integrated sector, and results of the analysis is the most economic growth is caused by structural changes.

Domestic scholars also explore the industrial structure and economic growth relationship: Zhou Zhenhua<sup>[4]</sup> (1995) based the industrial structure perspective analyzed the mechanism of economic growth ,and saw the economic structure is an important factor in determining economic growth point theoretical basis.Guo Jinlong and Zhang Xuying<sup>[5]</sup>(1998) used regression analysis to analyze economic growth from China's economic structural change, summarized industrial structure optimization plays an important role for sustainable and healthy development of China's economic.Chen Changbing and Xu Haiyan (2001) educed China's industrial structure contribution to the GDP growth rate is 7.04% with Empirical regression Analysis.

Scholars have proved that the industrial structure is an important factor affecting economic growth, but with the different study area and period of the conclusions of the study relationship is different, as China's new round of the arrival of the industrial structure, a large adjustment of the combination since the reform and opening up the economy quickly grow, structure significantly with changes in the historical development trajectory, analysis of the current of industrial structure and economic growth in the relationship between the new changes and new trends will have conducive to promote China's industrial structure optimization upgrade sustainable and rapid development and economic health.

## 2 Model

### 2.1 Causality test model

The correlation coefficient is one of the most common and effective method to test the correlation coefficient between variables, however there are two shortcomings: First, the correlation coefficient does not reflect a causal relationship between variables that is can not distinguish between the cause variable and the outcome variables; the second is the correlation coefficient is likely to cause a spurious correlation, that is, the original in reality the two variables, the formation of the two variables are highly relevant to the illusion of the existence of certain relationships on the trends. The Granger causality test proposed by the British econometricians Granger is one of the key methods to solve these two problems, the basic idea of the Granger causality test is: If X changes caused Y to change, so X changes before Y change. During the Granger causality test before the first data unit root testing, to determine the stationarity of time series, if the variable is non-stationary, we must further verify the existence of a cointegration relationship, otherwise the credibility of the Granger causality test results will be greatly reduced.

#### (1) Stationarity test

The common method of stationary test is the ADF (Augmented Dickey-Fuller) test, its model form is as follows:

$$\Delta X_t = \alpha + \beta t + \delta X_{t-1} + \sum_{i=1}^m \beta_i \Delta X_{t-i} + \varepsilon_t \quad (1)$$

$\varepsilon_t$  is white noise,  $\Delta$  is difference operator,  $t$  is time variable (trend factors).The null hypothesis  $H_0: \delta = 0$ , namely, the existence of a unit root time series is non-stationary; alternative assumptions:  $H_1: \delta \neq 0$ ; That there is no a unit root, time series is stationary.

#### (2) Cointegration test

If the variable is stable, you can proceed with the Granger causality test; if the variable is not stable, you need to further the cointegration test. The premise of the cointegration test is variable contains a unit root (i.e. first-order difference stationary), you can further test whether there is a long-term equilibrium relationship - cointegration relationship between variables.  $Y = C + \alpha X + \varepsilon$ .

The basic idea of Cointegration is: If two or more time series variables are non-stationary, but some of their linear combination, show smooth, and long-run equilibrium relationship between these variables. Cointegration test commonly used method included Engle-Granger two-step method and Johansen, the maximum likelihood method, frequency domain non-parametric spectral regression method, Bayesian method. EG two-step method (Engle, Granger two-step) cointegration test, first build the OLS regression equation:  $Y = C + \alpha X + \varepsilon$ .

Y is the dependent variable and X as independent variables, C is a constant,  $\alpha$  is the regression equation variable coefficient,  $\varepsilon$  is the residuals. Test the residuals  $\varepsilon$  for a smooth sequence, we can determine the variables Y and X Cointegration, or does not exist cointegration relationship.

#### (3) Granger causality test

With Stationary test or cointegration test variables, you can conduct the Granger causality test, otherwise it is impossible to test. Granger test requires the estimated regression equation:

$$Y_t = \sum_{i=1}^m \alpha_i X_{t-i} + \sum_{i=1}^m \beta_i Y_{t-i} + \varepsilon_{1t} \quad (2)$$

$$X_t = \sum_{i=1}^m \lambda_i X_{t-i} + \sum_{i=1}^m \delta_i Y_{t-i} + \varepsilon_{2t} \quad (3)$$

The original assumptions of the model (1)  $H_{10}$ : all  $\alpha_i$  are equal to zero; the original assumptions of the model (2)  $H_{20}$ : all  $\delta_i$  are equal and zero. Because there are four cases: accept  $H_{10}$ , accept both  $H_{20}$ , the two are not causally related; accepted  $H_{10}$ , rejected  $H_{20}$ ; accepted  $H_{20}$ , rejected  $H_{10}$ , so X is Y Granger reasons; rejected  $H_{10}$ , rejected  $H_{20}$  at the same time, they are with Granger cause each other.

The joint inspection of the partial regression coefficient of zero can be achieved by F test:

$$F = \frac{(RSS_R - RSS_U) / m}{RSS_U / (n - k)} \tag{4}$$

$RSS_R$  is bound to return to the original assumptions of the residual sum of squares,  $RSS_U$  indicates that the original assumptions, constrained regression residual sum of squares,  $m$  is the lag order,  $n$  is the number of samples,  $k$  is the regression factor in the constrained regression number. If the F value is greater than the critical value, reject the hypothesis that the causal relationships, on the contrary accept the null hypothesis.

**2.2 Regression model**

According to the commonly used statistical classification of the national economy, the industry is divided into three categories, namely, the three industries classification, due to the existence of influence of industrial structure on economic growth, namely, the industrial output is the input elements of the national economy, so you can build production influence function  $Y = f(A, X_1, X_2, X_3)$ , In which  $Y$  represents the gross domestic product (GDP),  $X_i$  Said the  $i$ -th industry value-added,  $A$  Said that the economic system and the technical level effects On function  $Y = f(A, X_1, X_2, X_3)$  perfectionist differential:

$$dY = \frac{\partial Y}{\partial X_1} dX_1 + \frac{\partial Y}{\partial X_2} dX_2 + \frac{\partial Y}{\partial X_3} dX_3 + \frac{\partial Y}{\partial A} dA \tag{5}$$

Equality divides both sides by  $Y$ -finishing available:

$$\frac{dY}{Y} = \frac{\partial Y}{\partial X_1} \frac{X_1}{Y} \frac{dX_1}{X_1} + \frac{\partial Y}{\partial X_2} \frac{X_2}{Y} \frac{dX_2}{X_2} + \frac{\partial Y}{\partial X_3} \frac{X_3}{Y} \frac{dX_3}{X_3} + \frac{\partial Y}{\partial A} \frac{A}{Y} \frac{dA}{A} \tag{6}$$

By the elasticity formula:  $\alpha = \frac{\partial Y}{\partial X} \frac{X}{Y}$

The above equation simplified to:

$$\frac{dY}{Y} = \alpha_1 \frac{dX_1}{X_1} + \alpha_2 \frac{dX_2}{X_2} + \alpha_3 \frac{dX_3}{X_3} + \frac{\partial Y}{\partial A} \frac{A}{Y} \frac{dA}{A} \tag{7}$$

Among them,  $\alpha_1, \alpha_2, \alpha_3$  representing the first, second, third flexibility of and  $\alpha = \frac{\partial Y}{\partial A} \frac{A}{Y} \frac{dA}{A}$ , adding

random error, can get the regression equation between economic growth and industrial structure model:

$$\ln Y = \alpha + \alpha_1 \ln X_1 + \alpha_2 \ln X_2 + \alpha_3 \ln X_3 + \varepsilon \tag{8}$$

**3 Empirical Analysis**

**3.1 Data**

This paper selects 1978-2010, China's gross domestic product (GDP) and the First, Second, and tertiary industry added value as a research object, the first, second and tertiary industries added value with the  $X_1, X_2, X_3$ ; basis of social retail price index on 1978, based on historical data reduction, to remove the impact of price changes. GDP, industry and social retail goods price index are from the 2011 Statistical Yearbook. Removing the effects of inflation are mainly two o'clock advantages: the one hand, take into account inflation, taking into account the time value of the data, remove inflation, GDP and industrial added value more comparable; the other hand, the removal of inflation can eliminate inflation non-stationary interference caused by the data, but also conducive to do smooth data analysis and regression testing.

An exponential relationship between the GDP and industry based on the regression model, in order to facilitate research, first of all variables in logarithmic processing, respectively, get  $\ln GDP, \ln X_1, \ln X_2$  and  $\ln X_3$  further examine the relationship between variables.

**3.2 Stationarity test**

Use Eviews software, with GDP from 1978 to 2010 a total of 33 years, the industry ( $X_1$ ), the secondary industry ( $X_2$ ), the tertiary industry ( $X_3$ ), respectively, taking the logarithm to get  $\ln GDP, \ln X_1, \ln X_2, \ln X_3$ , unit root test, and finishing results in Table 1.



**Table 1 Variables Stationarity Test**

Sequence	ADF test value	1% threshold	5% threshold	10% threshold	Conclusion
<i>LnGDP</i>	2.729735	-3.689194	-2.971853	-2.625121	Exist unit root
<i>LnX<sub>1</sub></i>	-0.151324	-3.653730	-2.957110	-2.617434	Exist unit root
<i>LnX<sub>2</sub></i>	1.833018	-3.670170	-2.963972	-2.621007	Exist unit root
<i>LnX<sub>3</sub></i>	0.901135	-3.699871	-2.976263	-2.627420	Exist unit root

Test results can be seen, the ADF of the four variables is greater than the 10% threshold, and therefore accept the null hypothesis that all variables are unit root non-stationary series. PP plot can also be visually observed, the variable upward trend in non-stationary series. Must be further observed first-order differential, to determine the possibility of a single whole, there is no need to carry out the cointegration analysis. Analyze each variable first-order differential stability analysis in Table 2.

**Table 2 The First-order Differential Variable Stationarity test**

Sequence	ADF test value	1% threshold	5% threshold	10% threshold	Conclusion
<i>LnGDP</i>	-2.819618	-3.661661	-2.960411	-2.619160	Don't Exist unit root
<i>LnX<sub>1</sub></i>	-6.749094	-3.661661	-2.960411	-2.619160	Don't Exist unit root
<i>LnX<sub>2</sub></i>	-3.669782	-3.670170	-2.963972	-2.621007	Don't Exist unit root
<i>LnX<sub>3</sub></i>	-5.249410	-3.689194	-2.971853	-2.625121	Don't Exist unit root

The first difference stationarity test explained the sequence of the first difference are stationary series, *LnGDP* first-order difference with 90 percent of the possibility is a smooth sequence, *LnX<sub>1</sub>* first difference with the 99 percent of the possibility is a smooth sequence, *LnX<sub>2</sub>* first order differential with 95 percent of the possibility is a smooth sequence, *LnX<sub>3</sub>* first order differential with 99 percent of the possibility is a smooth sequence, that is, each variable is a single integer, so you can cointegration test. EG two-step method to be tested, first constructed three regression equations:

$$LnGDP = C_i + \alpha_i LnX_i + \varepsilon_i, i=1,2,3; \tag{9}$$

Test residuals  $\varepsilon_i$  is a stationary sequence, they can determine the variables cointegration relationship between *LnGDP*, *LnX<sub>1</sub>*, *LnX<sub>2</sub>* and *LnX<sub>3</sub>*. The residuals of stationarity test results are shown in Table 3.

**Table 3 The Regression Residuals Stationary Test**

Sequence	ADF test value	1% threshold	5% threshold	10% threshold	Conclusion
$\varepsilon_1$	-3.765941	-3.670170	-2.963972	-2.621007	Don't Exist unit root
$\varepsilon_2$	-4.402012	-3.661661	-2.960411	-2.619160	Don't Exist unit root
$\varepsilon_3$	-3.660529	-3.661661	-2.960411	-2.619160	Don't Exist unit root

Residuals do not exist the unit root that is a stationary sequence on the table can be drawn, so can analyses further Granger causality test.

**3.3 Causality test**

Use Eviews to take on the 1978-2010 data, after logarithmic then Granger causality test, the lag period is selected as 1, the results are in table 4.

**Table 4 1978-2010 Variable Granger Causality Test**

H <sub>0</sub>	F-Value	P-value	Conclusion
<i>LnX<sub>1</sub></i> is not the <i>LnGDP</i> 's Granger cause	0.39981	0.5321	Do not reject
<i>LnGDP</i> is not the <i>LnX<sub>1</sub></i> 's Granger cause	12.9970	0.0012	Reject
<i>LnX<sub>2</sub></i> is not the <i>LnGDP</i> 's Granger cause	1.58637	0.2179	Do not reject
<i>LnGDP</i> is not the <i>LnX<sub>2</sub></i> 's Granger cause	4.03565	0.0539	Do not reject
<i>LnX<sub>3</sub></i> is not the <i>LnGDP</i> 's Granger cause	0.04738	0.8292	Do not reject
<i>LnGDP</i> is not the <i>LnX<sub>3</sub></i> 's Granger cause	0.97421	0.3318	Do not reject

Note: 5% significance level

Granger test results from Table 4, show that in the 5% significance level: the changes of China's gross domestic product (GDP) is the Granger cause of the primary industry growth, namely, raising the level of China's overall economic development can improve the first industry output value. However the increasing output value of primary industry is not the Granger cause to GDP growth, the growth of the primary industry has little effect on the level of national economic development; the secondary and tertiary increasing output value has no Granger causality between industrial output growth and GDP growth, significant interaction between the second and tertiary industries and economic growth does not exist. If the level is significantly increased to 10%, then GDP growth will be the second industrial growth Granger cause, the national economic growth can significantly promote the development of secondary industries.

The first two points in the above three conclusions are in line with the current economic structure and level of development. the actual situation in China is still in a period of industrialization, the proportion of primary industry decreased its industrial output value increased by more than rely on the economic development of the application of new technologies such as fertilizers, pesticides, seeds, mechanization, factory and product deep processing; and lower added value of primary industry, growth does not give the economy a larger role in promoting growth with the primary industry of national economic growth to be significantly lower than the national economy's impact on the growth of the primary industry. However, in current industrialization stage, growth of secondary industry should be the reasons for national economic growth. In the causality test, the secondary industry is Granger cause of GDP, should not be showing the opposite characteristics. We believe this is caused due to a longer time-series data, China has experienced 30 years of economic development, in terms of industry structure, market structure, development pattern, the current market compared to 1978 occurred a great change, resulting in data reflect distortion, it is necessary to segment analysis of the data, where the deepening of reform and opening up in 1992 as a dividing point, the time series data into the 1987-1991 and 1992-2010 years ago, following two were Grand Jay causality test analysis, tables 5 and 6.

(1)1978-1991 variable causality test

**Table 5 1978-1991 Variable Granger Causality Test**

$H_0$	F-Value	P-value	Conclusion
$LnX_1$ is not the $LnGDP$ 's Granger cause	4.30409	0.0648	Do not reject
$LnGDP$ is not the $LnX_1$ 's Granger cause	0.19114	0.6713	Do not reject
$LnX_2$ is not the $LnGDP$ 's Granger cause	20.8403	0.0010	Reject
$LnGDP$ is not the $LnX_2$ 's Granger cause	24.1142	0.0006	Reject
$LnX_3$ is not the $LnGDP$ 's Granger cause	0.80817	0.3898	Do not reject
$LnGDP$ is not the $LnX_3$ 's Granger cause	8.35038	0.0161	Reject

Note: 5% significance level

Be seen from Table 5, from 1978 to 1991, China's industrial structure and economic growth show a high correlation. Under the 5% significance level: there is no a significant Granger causality relationship between primary industry and GDP; the secondary industry and GDP are mutually reinforcing significantly, and the development of secondary industries can promote economic development, and national economic development but also in turn conducive to the development of secondary industry, this is mainly due to the stage in the reform and opening up Initially, the material needs of the national contradictions relative prominence of the industrial development of the economy into a powerful vitality, economic development of the national income increase is also beneficial to improve the purchasing power to buy industrial products, show both a high degree of mutual causality; GDP is the Granger cause to the development of tertiary industry, which is due to the reform and opening up before our individuals engaged in commercial activities, restrictions caused by the service sector development has lagged behind economic growth brought about by the reform and opening to expand the service needs towards the people, to promote the services sector development. Under 10% significance level, the primary industry is the GDP's Granger cause, which is the improvement of the gross national product due to the reform and opening up of China's agriculture accounted for up to one third, the improvement of agricultural output has a high role in promoting .the development.

(2)1992-2010 year variable causality test

**Table 6 1992-2010 Variable Granger Causality Test**

$H_0$	F-Value	P-value	Conclusion
$LnX_1$ is not the $LnGDP$ 's Granger cause	2.99420	0.1041	Do not reject
$LnGDP$ is not the $LnX_1$ 's Granger cause	8.20857	0.0118	Reject
$LnX_2$ is not the $LnGDP$ 's Granger cause	3.59742	0.0773	Do not reject
$LnGDP$ is not the $LnX_2$ 's Granger cause	6.86257	0.0193	Reject
$LnX_3$ is not the $LnGDP$ 's Granger cause	2.60032	0.1277	Do not reject
$LnGDP$ is not the $LnX_3$ 's Granger cause	0.01756	0.8963	Do not reject

Note: 5% significance level

It can be seen from Table 6, under the 5% significance level: the primary industry is not the GDP's Granger cause, but GDP is Granger cause of the first industry, that the national economic development to promote the development of the primary industry, is due to agriculture accounts for only about 10% of the national economy, this proportion is one-third of the reform and opening up, agriculture is no longer the highlight of the national economy, on the contrary the first industry relies more on national economic development to promote agricultural modernization and improve agricultural productivity; the secondary industry is not the GDP's Granger cause, but GDP is Granger cause of the secondary industry, the national economic development promote the development of secondary industry; the tertiary industry and GDP do not exist significant causal relationship. Significantly raise the level to 10%, secondary industry will be the GDP's Granger cause.

There are many reasons for these results, mainly due to China's regional economic differences and inequitable development. many developed eastern coastal cities such as Beijing, Shanghai of China, service industry has been as high as 70% or more, the service has entered the post-industrial era economic restructuring, the secondary industry is not the reason of GDP growth, GDP growth, in turn, will promote high-end industrial development. but central and western regions are still in the middle stage of industrialization, the second industry is still the main reason for GDP growth, which resulted in our whole secondary industry accounted for the dominant position of the national economy, but the end keeps the proportion of fluctuations in more than 45% rather than rapid growth, will show the growth of secondary industry is causes of GDP growth which is not obvious overall GDP growth.

Comparison with Table 6 and Table 5, the corresponding P-value of the causal relationship can be drawn: first, in the " $LnX_1$  is not the Granger cause of  $LnGDP$ ", the P values increased, in the " $LnGDP$  is not the Granger cause of  $LnX_1$ ", P was significantly lower, indicating that the first industrial development gradually don't promote economic development, but contrary the national economy development provide power to the first industrial development. second, in the " $LnX_2$  is not the Granger cause of  $LnGDP$ " and  $LnGDP$  is not Granger cause of  $LnX_2$ , the P values were increased, indicating that the secondary industry and the national economy is no longer close; in the " $LnX_3$  is not the Granger cause of  $LnGDP$ ", P value fell, P value of " $LnGDP$  is not Granger cause of  $LnX_1$ " significantly increased, explained the development of the national economy gradually is no longer the reason of the development of tertiary industry and the development of tertiary industry is gradually emerging role of national economic development. This is in line with the famous "Petty-Clark theorem" about the industrial structure of the thesis, namely: economic development, per capita income increased levels of national income and labor relative proportion of primary industry is gradually declining; the second industry of national income and the relative proportion of the labor force increased by further economic development, national income and labor relative proportion of tertiary industry also began to rise.

#### 4 Conclusion

This paper demonstrates that there are a kind of long-term stable equilibrium cointegration relationship between industrial structure and economic growth, the changes of industrial structure changes have a significant effect on economic growth, and this effect showed different characteristics in different stages of development, the current primary industry has entered the stage of development of economic feeding, the economic dominance of the secondary industry is changing, tertiary industry will gradually become the new engine of economic growth. But the secondary industry is still important reason for China's national economic growth, China has a vast territory, unbalanced regional development, should be actively promoted the coordinated development of regional economy, accelerate the industrialization process of the central and western regions, and promote the developed eastern

region to service-oriented economic restructuring, promote the development of modern manufacturing high-tech industries, in order to enhance the national economy quality.

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# Research on the Cost and Benefit Management of Introducing High-Level Talents in University\*

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**Abstract:** With the coming of knowledge economy area and the change of colleges and universities development requests, talents have become the major force of competition among the universities. Many colleges neglects introducing high-level talents the input and output, do not consider their specific situation, the introduction of blind, high cost and do not bring the expected benefits. By analyzing the main contents of introducing high-level talents costs and the factors of influencing talent benefits, thereby to go deep in to the problems of influencing high-level talents costs and benefits, then put forward some measures to reduce cost and increase revenue.

**Key Words:** High-level talents; Introduce cost; Benefit; Countermeasure; Cost analysis

## 1 Introduction

The 21st century is the information and knowledge economics era. Since our country has joined WTO, the politics, economy, culture and other aspects should have more and more contracts with the other countries, so the competition of talents has becoming more intense. The competitions among countries have become into talents competitions gradually, so who owns talents has the dominant position in the competition, moreover the colleges and universities are the main place to cultivate high quality and high level talents. Therefore the training of qualified personnel has become very important to the universities. In addition the launch of science-education development strategy and the rapid development of science and technology not only to create opportunity, but also to bring challenges for the development of educational enterprise of university. In order to seize the opportunity and meet the challenge, colleges and universities have to strengthen training teaching staff and train more talents inevitably. But it is risky to introduce talents; the unquestioning introduction can't reach the purpose of introduction, but also waste the university resources, thus hinder the development of the colleges and universities. How to reduce the introduce cost and increase the benefits of introducing talents are the problems which must be solved in the process of introducing talents.

Developed countries to compete for overseas talents, formulate and revise the migration and study policy, for the overseas high-level talents resource into their open up the green channel, attract and accept many countries of human resources<sup>[1]</sup>. Talent introduce work or pay attention to in quantity and ignore the quality problem, high cost and low benefit to the policy of introducing talents and not promoting college's fast development. Based on the consideration not only pay attention to introduce talents when introducing this link, the most important is because of the cost of money will be the benefit of the introduction in combination, make a complete measures, give full pay to the resource advantages of high-level personnel.

## 2 The Cost Analysis of Introducing High-level Talents in University

### 2.1 The introduce cost of high-level talents in university

The high-level talents are point to have doctor's degree and associate professor title, and the experts or academic leaders who has influence in some areas<sup>[2]</sup>. The cost input of introducing high-level talents in university roughly includes recruitment costs, training education expenses and wage subsidies, concretely includes recruitment advertisement costs, entertainment expenses, travel expenses, transportation, the wages of introduce talents, allowance, scientific research allowance, relocation allowance, the costs of solving spouses' work and their children's schooling, the increase of training cost and so on<sup>[3]</sup>. The introduced high-level talents will most likely have professional knowledge and work experience, so they have cost less in the training education expenses. In order to make the introduced talents focus on their work and serve for the university for a long time, the university pay a lot of family

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allowance, and also help solve the family problems, this part of cost occupy the larger proportion of the introduce cost, this is the important part of university to reduce the introduce cost.

**2.2 The Cost Analysis of introducing high-level talents**

**Table 1 the talent introduction cost specific amount of Zhongyuan University of technology**

Unit: Yuan

Cost Level Elem net	talent	academicians of the Chinese Academy of Sciences and Chinese Academy of Engineering	Provincial distinguished professor	school discipline distinguished professor	Doctor and graduate student(include postdoctoral)
residence, setting-in allowance		0	1040000	1040000	150000
job subsidies		0	120000	100000	0
Scientific research allowance		0	500000	100000	50000
Total		0	1660000	1240000	200000

Note: Because there are no academicians for the moment of Zhongyuan University of Technology, this cost is 0. We offer 130square meters housing for the provincial and university distinguished professor, according to current average price of 8000 per square meters in Zhengzhou of Henan Province. Because the recruitment and training cost and wages are all the same, they are not included in the list. In order to introduce the high-level talents, the university grants them to solve their spouses and children’s problems, while this hidden cost cannot be expressed as data, so it is not listed in this table.

It can be seen that the problems of input costs when the university introducing high-level talents:

(1) The input cost is more than the general types of talents. For introducing high-level talents some universities at all costs and regardless of the input costs. By offering the residence, setting-in allowance, job subsidies, scientific research allowance, resolving their spouses’ work and children’s school problems, these favorable conditions attract the high-level talents. The higher level, the more favorable policies, the highest of the university’s cost.

(2) The input cost mainly concentrates on the residence, setting-in allowance, job subsidies, scientific research allowance, resolving their spouses’ work and children’s school problems. And the highest is the setting-in allowance, the higher-level talents’ costs are higher. The cost of solving their spouse’s work and children’s school problem are not just money, but also low academic spouse, the university only solves these problems on themselves, and it reduces the overall quality of the university workers, this cost cannot measure it with figures.

**3 The Benefit Analysis of introducing high-level Talents in University**

**3.1 The Embodiment of Benefit of introducing high-level Talents**

Efficiency is a concept in economics, that is in order to pursuing a maximum profit the economic entity in the market, they take many times to increase production, there will be a difference between the benefits of every investment and the last benefits of investment, this difference is the efficiency. From the content the benefits of introducing high-level talents in university can be divided into social benefits (that is to increase the social status of university and improve the level of university) and economic benefits (that is to get the national project fund and attract more teachers and students); from the time length the benefits can be divided in to long-term benefit and short-term benefit.

**3.2 The Problems of Introducing High-level Talents Benefits**

On the one hand the benefits of introducing talents cannot be measured accurately. According to the scientific research and teaching to evaluate the benefits of introducing high-level talents in university. The university offers the relevant cost of scientific research when they introduce the high-level talents, and hope that they will give more results, and then improve the scientific research level and ability of the university. Through the teaching work the high-level talents will train high quality students, thereby improve the teaching quality and teaching level. But the university is different from enterprise, teachers’ labor have the ambiguity of labor time, the complexity of evaluation, the indirection and longevity of

value realization<sup>[4]</sup>. The cycle of value realization is long of introducing talents in university, it's hard to assess the stand or fall of introducing high-level talents' cost with the scientific research level and teaching level in a short time. On the other hand is the risk of introducing talents. The university uses the educational background as the criterion when they introduce the high-level talents, and this measure is lack of necessary skills tests. If they introduce some well-educated but the lower ability talents, it will make the university pay a heavy price, however, the university do not improve the scientific research level and teaching level, thus reduce the benefits of introducing talents.

#### 4 Results and Suggestions

In order to introduce high-level talents, the universities put the huge cost but ignore the benefits, and there is balance between the costs and benefits. Not only cause the wastes of resources but also not realized the purpose of introducing the high-level talents and it also hinders the development of the universities. So put forward some measures which reduce cost and increase profits:

1) It needs to introducing plan when to introduce high-level talents. The university costs big price when they introduce high-level talents, so they should not introduce without a purpose. Firstly, the university should break the experienced only, and should introduce the real talented core team leader. They can not only pay attention to the education, professional title and the number of published papers when they introducing talents, but to examine the comprehensive abilities, thereby introduce the talented and capable individuals, avoid influencing the quality of introduced talents and the quality of teaching, thus mislead and cause harm to the young men, finally it will affect the meritocratic quality of university and hamper the development of university. Secondly, its need to do the forecast analysis well and make the construction planning of teachers' team. According to the university's construction planning and the actual need, the university should center on their discipline construction, the university need to refine the number, quality, consist and levels of introducing talents, and then make the introduce planning which is predicted and also can reduce the cost.

2) When they introduce the talents, meanwhile, they should cultivate the internal talents, university should not pay attention to the "external" blindly, the internal talents are also the important force of their development. They need make full use of the knowledge of external talents, using external talents drive the internal and using the higher drive the lower, using the core drive the whole team, thus train the high-level talents of themselves. It should not only to expand the number of teachers' team and improve the malignant competition of introducing talents in university, but also to increase the overall level of teachers' team in university. Considering the long-term development of university, the enhancing of university's comprehensive strength can reduce the introduced talents in the future and the introducing cost of high-level talent.

3) The universities need to change the traditional introduce model and construct the diversified introduce model. On one hand it can change all talent the management mode, it has been found that: the highest cost is cultivating talents but not using them, then is cultivating and using them, the lowest cost is using the talents, but not cultivating them<sup>[5]</sup>. For the purpose of introducing talents the university should build the free flow of talent mode and also build cooperation relationship. The "ownership" has turned into "right to use" which can solve the difficult of introducing talents and realize the sharing of talents resources, and then reduce the cost of introducing talents. On the other hand, the universities may establish university alliance and promote the communication and cooperation of teachers among the adjacent universities, making the union university shared the cost of introducing talents and reducing the cost of introducing talents greatly.

4) Open a green channel and the appropriate policy tilt, communicating with the local government, adopting appropriate policy tilt aim at high-tech talents. The university should negotiate with the government and offer the corresponding preferential policies when the government introduce high-level talents, for example give certain subsidies and acquire the pro-gaze of high-level talents, thus part of introducing high-level talents' costs paid by the government, and then reduce the introduce costs of university.

#### 5 Conclusion

Through the specific analysis of introduce cost content, find the important factors of influencing the introduce costs and benefits. According to the problems the university should put forward measures to reduce the costs and increase the benefits; the university should also make the more reasonable human resource plan and policy. Making the high-level talents which introduced by universities play a

better role, promote the strength, managerial level and the rapid development of university. But the article for the benefit of the talents without an accurate quantitative evaluation method, the future will have to solve how to measure benefit and improved fundamentally introduction of high-level personnel benefits.

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## How Sales Promotion Increase Short-Term Sales of Luxury Product in Emerging Economy: A Case of Hennessy in Cambodia

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**Abstract:** Sales promotion as one of the key factors in promotional mix has been in constant growth since the 1960's for marketing luxury products in emerging economy. To provide a better understanding about how sales promotion helps Hennessy increase sales in Cambodia, a qualitative approach of case study was used to interview with consumers of Hennessy in Cambodia as a primary data collection tool. The findings indicate that the company has successfully used sales promotion such as Contest, Sweepstakes, premium, sampling, trade allowances, free merchandise, and so on for Hennessy in the Cambodian market. The focus, however, is not always on using sales tools to generate sales, but to improve relationships.

**Key words:** Sales Promotion; Luxury Products; Emerging Economy

### 1 Introduction

Promotion as one of the key factors in the marketing mix and has a key role in market success, which can be used to ensure the awareness of a luxury product in an emerging economy. The promotional mix is the combination of the different tools that can be used to convey appealing message to the customers. The tools can be advertising, direct marketing, public relations, personal selling, and sales promotion<sup>[1]</sup>. Among which, sales promotion consists of short-term incentives to encourage purchase or sales of a product or service, whereas advertising offers reasons to buy a product or service but sales promotion offers reasons to buy now<sup>[2]</sup>. Over the past two decades the popularity of sales promotion has been increasing. Two reasons for this increased popularity are undoubtedly related with the increased pressure on performance based on short-term results and the emergence of new purchase tracking technology.

The luxury goods industry is unique because it heavily relies on aggressive marketing and promotion to sell products to a specified group of people. Businesses that involved in marketing of luxury products use careful planning and implementation of sales promotional tools to generate business lead, stimulate purchase, reward customers and motivate sales people. Although the luxury market has been increasing greatly over the last decade and the marketing literature has recently seen substantial interest in the study of luxury brands, little is known about how best to market and monitor luxury brands<sup>[3]</sup>.

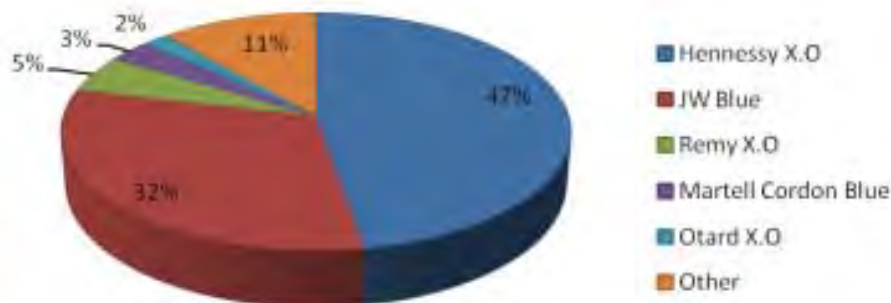


Figure 1 Market Share of Hennessy X.O in Cambodia in 2008

Cambodia is a developing country, so the income of Cambodian’s people increases from day to day. Hennessy is one of luxury products which people have known that its quality is very good and popularity, but the price is relatively higher than the other local wine products. Consumption of Hennessy has increased in Cambodia in recent years. As luxury goods, Hennessy products are also goods for which demand increases relatively more than income increases. Luxury goods therefore have high income elasticity of demand.[<sup>4</sup>]

By using the marketing of Hennessy product as a yardstick, this study aims to gain a better understanding about how sales promotions impact on the sales of luxury products for the consumer market in an emerging economy like Cambodia. In Cambodia, consumers of Hennessy are mostly high income and high class people, who are mainly targeted by Attwood Import Export Co., Ltd in Cambodia market.

**2 Research Methodologies**

**2.1 Source of data**

For the purpose of this study primary and secondary data are important. Primary and secondary data are collected by using various tools and techniques. Primary data are collected through questionnaire, interview with Hennessy consumers in Phnom Penh city, interview and discussion with the marketing manager and marketing staff of Attwood Import Export Co.; Ltd, observation and survey on Hennessy market situation in Cambodia. Secondary data are collected from Attwood Import Export Co.; Ltd, internet and some documents from the libraries at the Universities, and statistical data released by government of Cambodia.

**2.2 Sample selection**

The target population for this research is consumers who bought and drank Hennessy. Among 120 consumers are selected for in-depth interview and questionnaire survey, from which interview 100 completed and valid questionnaires are collected for data analysis in this research.

**3 Data Analysis**

**3.1 Consumption habits**

From the collected data we find out that among 100 respondents 26% are between 26 and 33 years old, and 25 are between 18 and 25. The most frequent drinkers are quite young but for a brand for elder generation, the reason could be understood as their fans for adventure and/or richness from their parents. The frequency for drinking can be grouped from the data as 46% under 1 time per month, 38% between 2-5 times per month, and 16% over 6 times per month.

As to their occupation 40% work in private company, more than 27% in government, 17% as exploiter, 13% as student and 3% at NGO . The consumers normally drink at club (bar), karaoke, and special occasion. Some consumers buy Hennessy as gift for some special person during the special day. Most of Hennessy’s consumers are living in town and city.

According to Table 1 it can be found that 63% respondents prefer to drink Hennessy for some special party rather than a habitual drinking.

**Table 1 Drinking Occasion**

Kind of Party	Number of Consumer	Percentage %
Wedding	14	14%
New House	01	01%
Birthday	05	05%
Meet with Friends	17	17%
Special Party	63	63%
Total	100	100%

**3.2 Preference for advertisement medium**

**Table 2 Advertisement System Consumers Like**

Advertisement System	Number of Consumer	Percentage %
Newspaper	11	11%
Magazine	07	07%
Radio	05	05%
TV	33	33%
Internet	08	08%
Banner	34	34%
Leaflet	02	02%
Total	100	100%

According to Table 2 we find that 34% respondents are attracted by advertisement of sales promotion on banner and 33% by advertisement on TV, 11% by advertisement on newspaper 11%, 8% by advertisement on internet, 7% by advertisement on magazine, 5% by advertisement on radio, and 2% by advertisement on leaflet.

**Table 3 Ranking of Sales Promotion Tools**

Sales Promotion Tools	Number of Consumer	Percentage %
Coupons	29	29%
Sweepstakes	17	17%
Rebates	14	14%
Contests	04	04%
Deals	11	11%
Premiums	22	22%
Sampling	03	03%
Total	100	100%

From Table 3 we also find that 29% respondents prefer to receive coupons, 22% respondents to receive premium. From Table 4 we find out that 28% respondents expect immediate discount from the dealer or Hennessy, 25% expect free samples, 22% welcome repetition of advertisement.

**Table 4 Consumers' Suggestion for Attwood Company about Hennessy**

Consumer Proposal	Number of Consumer	Percentage %
Discount	28	28%
Sweepstakes	06	06%
Increase Advertising	22	22%
Coupon	19	19%
Free Goods	25	25%
Total	100	100%

## 4 Conclusions

Sales promotion is very important for Hennessy to increase sales in Cambodia. Sales promotion tools can be used either as a push strategy towards dealers or as pull strategy towards end consumers. Though Hennessy is a popular brand with international fame, it's still difficult to sell more in Cambodian market if without proper sales promotion. Such a high price is the weakness for Hennessy to compete against their competitors in the market. This is why the marketing managers have decided to frequently use promotion tools to attract more consumers to buy Hennessy. The company has successfully to use sales promotion for Hennessy in the Cambodian market. These sales promotion tools such as Contest, Sweepstakes, premium, sampling, trade allowances, free merchandise, and so on.

This research has shown that sales promotion is not only important for creating short term sales increase, it is also an important tool for creating and maintaining market relationships. Therefore it is

very important for the manager not only to use sale promotion as a buying incitement for the customer, he should also use it for relationship creating and maintaining.

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## Discusses on Performance Budget Evaluation System\*

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**Abstract:** Performance budget evaluation is an important management innovation in the field of finance, but there are many difficult problems in practice. It is necessary to study how to design performance budget index system, methodology and so on. This paper analyses the connotation of performance budget evaluation system, puts up principles of performance budget evaluation system. On the base of it, this paper designs university performance evaluation system and evaluation index system. Finally this paper makes some suggestions how to carry it into practice.

**Key words:** university, performance budget evaluation, index system

### 1 Introduction

High school is an education agency to cultivate training talent, provide scientific research and social service. As a scarce social resource, it is important to make research in all countries how governments configure resource effectively. Performance budget evaluation is an important innovation in financial field. It can solve the problems who spend more effectively and whether money is spent worthlessly. Through performance budget evaluation, government can configure resource more effectively and optimize the allocation of resources. It is also be helpful for universities to set reasonable strategic target and develop better. So the budget performance evaluation is the direction of research in many countries. Since the 1980s, foreign countries began to study university performance budget evaluation. Our country put forward to establishing performance budget evaluation system at the Third Plenum of the 16th Central Committee of the CPC.

But there are many problems in implementation process of budget performance evaluation. It is very difficult to design performance index. Ma Guoxian, a professor in Shanghai University of Finance and Economics, said it is worldwide "performance indicators difficult problem". It is also difficulty to establish performance evaluation method and to carry out in practice. All these problems are needed to be studied and solved.

### 2 Connotation of Performance Budget Evaluation System

Performance budget evaluation is that government and financial department use performance index to make objective and fair evaluation and appraisal on performance of public spending.

The university performance budget evaluation system is a dynamic cycle system. On the base of strategic planning, universities set up budget performance target, decompose target, draw up budget and return to performance targets and strategic planning through performance evaluation.

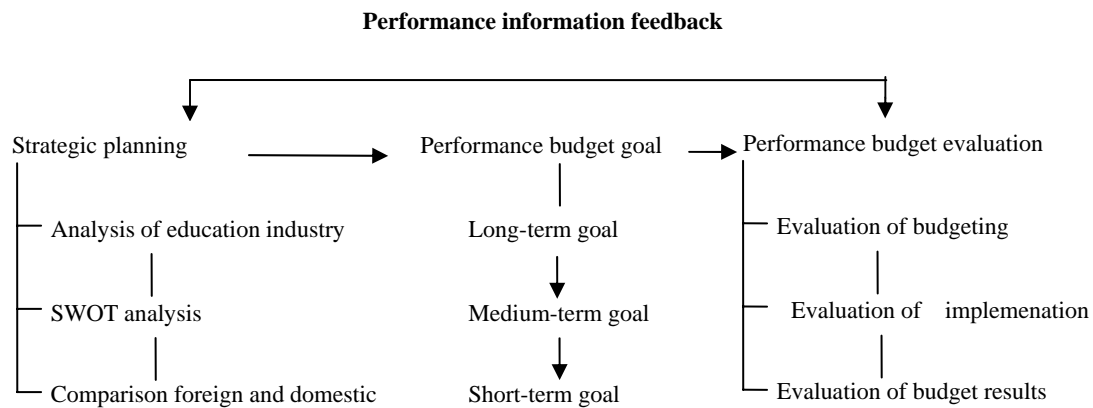
The system of performance budget evaluation contains three contents. One is goal evaluation, which is to evaluate strategic planning, rationality and feasibility of performance target and so on. The second is budget evaluation, which is to evaluate budgeting, budget execution, budget implementation evaluation. The third contents is results and impact evaluation, which is to evaluate result and continuous influence.

The main steps contain: 1) to set up strategic planning; 2) to set up budget performance strategic goal of universities, which includes long-term performance goal(five-ten years) and annual performance goal and establishes the relationship between budget requirements and performance goal. 3)to evaluate budgeting, budget implementation, budget implementation results at the end of financial year.4)to adjust strategic planning and performance goals according to the feedback.

The performance budget evaluation system of university is shown in figure 1.

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**Figure 1 The Performance Budget Evaluation System**

### 3 Design Principles of Performance Budget Evaluation System

#### 3.1 Economic benefit and Social public benefit

Higher education investment has not only economic benefit but also public benefit. These should be considered in performance evaluation of higher education, such as graduate employment rate, scientific research achievements conversion rate, ecological environment and so on.

#### 3.2 Individual and Integrity

With the increasing popularity of higher education, universities display diverse trend. There are deployment universities and local universities, private universities and public universities, "State 211 Project" and "State 985 Project", etc. We couldn't evaluate different universities using the same performance budget evaluation system. It should include general index and special index in university performance budget evaluation system.

#### 3.3 Comprehensive and Importance

An integrity performance budget evaluation system should include the whole process of budgeting, budget implementation and budget implementation results. But designed index couldn't include every aspect and should be emphasis on some aspects.

#### 3.4 Scientific and Feasible

The performance evaluation system should objectively reflect university current situation. The indexes should not only be independence but also be linked. In designing index, we should consider not only the purpose and needs of research but also the possibility of objective conditions. The date in index could be obtained from existing financial information and be simplified as far as possible.

#### 3.5 Timeliness and Sustainability

According to university performance evaluation, we can evaluate university current situation and find problems in time so we can correct timely to reduce loss. Timeliness is very important to university. In addition to timeliness, the evaluation system should be sustainability. Longer the evaluation time is, more obvious the performance tread is. It could help university to set long-term goal and avoid opportunism.

#### 3.6 Conclusive and Orientation

The performance evaluation is not simple evaluations of the result of budgetary revenues and expenditures. The more importance is to evaluate effect of resource allocation, which could help universities comprehensively understand its condition, analyze subjective and objective factors and optimize allocation of resources to promote the development.

### 4 Designing University Performance Evaluation System

#### 4.1 University strategic planning

Universities should make clear mission according to its function. On the base of it, each department establishes its strategic planning through the long-term strategic planning. According to SWOT, universities identify their own competitive advantage, opportunities and threats to combine strategic planning with internal and external environment.

The analysis of university strategic planning is shown in figure 2:

<p>Strength--S Hardware facilities is improved; Teachers' quality is high; Adapting to social development; Public relation is good; .....</p>	<p>Weakness—W Lack of core competitiveness; Mechanism is not flexible; The contradiction of talent supply and demand is prominent; .....</p>
<p>Opportunity—O The demand of high level talented person is increasing; Higher education needs of people is increasing; National policy encouragement; school-aged population is huge; ...</p>	<p>Threat—T Overseas training and all kinds of nonacademic education is rising; High quality education resources is shortage; Market and technological environment bring a lot of challenges ;</p>

**Figure 2 SWOT Analyse of University Strategic Planning**

**4.2 University performance budget goal**

On the base of strategic planning, universities set up long-term performance budget goal and annual budget.

**4.3 Designing performance budget evaluation system index**

This paper selects some representative index and design performance budget evaluation system through Analytic Hierarchy Process, (“ AHP” for short). The index system is divided into three levels. The fist level contains teaching performance evaluation index, scientific research performance evaluation index, and financial management performance evaluation index. Each level contains some index and shown in table 1.

**Table 1 University Performance Budget Evaluation Index**

Level 1 index	Level 2 index	Level 3 index	Calculation method
Teaching performance evaluation index	Teaching expenditure index	Teacher-student ratio	equivalent students/teachers
		Students' average teaching expenditure	Education expenditure/equivalent full-time students
		Students' average book cost(including electronic books)	Book cost/ equivalent full-time students
		Students' average practice expenditure	practice expenditure/equivalent full-time students
		Students' average teaching space index	teaching space / equivalent full-time students
		Students' average teaching and scientific research instrument equipment cost index	teaching and scientific research instrument equipment cost / equivalent full-time students
	Teaching quality index	National excellent Doctoral dissertation ratio	Number of National Excellent Doctoral Dissertation / PhD Candidate
		National level excellent course ratio	Number of national level excellent course / undergraduate students per thousand
		National outstanding textbook ratio	Number of national outstanding textbook ratio / undergraduate students per thousand
		National outstanding achievement award ratio	Number of national outstanding achievement award ratio / undergraduate students per thousand
Scientific research performance evaluation index	Research ability index	Teachers' average research project ratio	Number of research projects/ teaching and research staff
		Number of national project	Number of 973/986/national project/project supported by NSFC.....
		National project amount	Amount of 973/986/national project/project supported by NSFC.....
		National project ratio	Number of national projects/number of scientific research project
		National project amount ratio	National project amount/scientific research project amount

		National research platform	National laboratory/national key laboratory/national engineering center/defense laboratory/national humanities and social science lab
	Scientific research achievements index	High level paper ratio	EI papers/teaching and research staff
		Cited papers ratio	SCI cited papers/ teaching and research staff
		Invention patent ratio	Number of invention patents / teaching and research staff
		scientific research monograph numbers ratio	scientific research monograph numbers / teaching and research staff
		teachers' average papers published in foreign academic journals	papers published in foreign academic journals / teaching and research staff
Financial management performance evaluation index	Financing index	Self-raised funds ratio	self-raised funds /gross income
	Budgeting index	Budget completion rate	Actual expenditure/budget expenditure
		Special funds Budget completion rate	Actual expenditure of special funds /budget expenditure of special funds
		Zero-balance accounts completion rate	Actual expenditure of zero-balance accounts /budget expenditure of zero-balance accounts
		Supplementary budget for expenditure ratio	special funds supplementary budget expenditure / special funds budget expenditure
	Financial regulations index	Financial management system	
		Performance of financial management system	
		Internal control system	
	Financial situation index	Assets liabilities ratio	Gross liabilities /gross assets
		Year-end balance	Total revenues-total expenses
		Education for appropriate ratio	Education for appropriate / total revenues
		Scientific research for appropriate ratio	Scientific research for appropriate / total revenues
		Education income ratio	Education income / total revenues
		Research income ratio	Research income / total revenues
		Basic expenditure ratio	Basic expenditure / total expenses
		project expenditure ratio	project expenditure / total expenses
		Wages and welfare expenses ratio	Wages and welfare expenses / total expenses
		Spending on goods and services ratio	Spending on goods and services / total expenses
		personal and family allowances ratio	personal and family allowances/ total expenses
		Other capital expenditure ratio	Other capital expenditure/ total expenses
rate of return on investment		Investment income/investment	
Foreign investment index	Alumni donation amount		
Social benefits performance evaluation index	Reputation index	Alumni donation ratio	Donation number / Effective number of alumni
		Employment rate	The employment of students / Graduate students
	Employment index		



#### **4.4 Method of university performance budget evaluation**

This paper briefly designs the performance evaluation index system of university. Furthermore, we need to use scientific evaluation method to evaluate results. There are some common methods such as the comprehensive evaluation method, layer analytical method, and fuzzy comprehensive evaluation method, Program Assessment Rating Tool (“PART” for short) and so on. It is needed to be further studied.

### **5 Conclusion**

University budget performance evaluation is not an independent system, it needs corresponding environment and institutional support. The performance budget evaluation of university still face many difficulties in implementation, we still need to take the following measures to ensure the smooth implementation of university budget performance evaluation.

#### **5.1 To strengthen the relevant system construction**

Budget performance evaluation demands that university being evaluated provides related foundation information and relevant materials. In order to avoid providing false report, government must make the budget systematized and legislated, and formulate relevant systems and laws. All of evaluation content, index, time and methods should be informed to various universities. Governments appeal to universities to take an active part in it, making sure the budget and performance evaluation is carried out in practice.

At the same time we must build a corresponding system of awards and penalizations. The reward must be clear and distinct to ensure university budget performance evaluation work into effect.

#### **5.2 Reform University accounting system**

Current financial accounting of university still executes on cash basis. It can't really reflect the true financial condition. Infrastructure financial is accounted for separately, which bring about accounting subject of universities with two sets of accounting system. It will affect some index effect. So universities should reform accounting system as soon as possible, execute on accrual basis and establish the restraint system, incentive system and reporting system of performance budget management.

#### **5.3 Full participation**

The performance budget evaluation of university is not only related with school. It includes faculty performance evaluation, individual performance evaluation. So universities should mobilize all people enthusiasm.

#### **5.4 To strengthen the information construction**

University budget performance evaluation needs a number of based data to establish and perfect information system. Information construction is a basic work of budget performance evaluation, which can not only improve the work efficiency but also transparency. It can also create a fair information symmetry and justice environment.

#### **5.5 To strengthen the team building**

Performance evaluation is a very professional job. Participants must have certain knowledge and professional quality. It is important to strengthen the team building. First, it needs a group of researchers to design the budget performance evaluation system and find out countermeasures in the actual work. Second, it needs a group of talent with both theory knowledge and organization ability. Intermediary organizations can participate in this process. Finally, it needs universal education about university performance budget evaluation concept and knowledge to let all people take part in.

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## Internationalization of RMB: Benefits, Constraints and Proposals

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**Abstract:** With the acceleration of global economic integration process and the rapid development of China in the world economy, the issue of RMB internationalization has gradually become the hot topic in the academic research field. The aim seems only too logical; that the second biggest economy in the world wants to promote its currency is perfectly understandable. Whether China wants to play a bigger role in the International Political Economy (IPE), it needs greater autonomy in international monetary affairs, and what better way to achieve this than to use its own currency in international transactions. The principal aims of this article is to provide a brief of how far has China gone on the internationalization of its currency, the RMB, to identify the main benefits, point the main constraints and finally the proposals that this process entails. At present the RMB is not used internationally yet, the RMB internationalization will signify a New Era of rapid growth in China's trade and investment links with the world.

**Key words:** RMB Internationalization; Benefits; Constraints; Proposals

### 1 Introduction

China is the world's second largest economy after the United States. It is the world's fastest-growing major economy, with average growth rates of 10% for the past 30 years. China is also the largest exporter and second largest importer of goods in the world. For 2010, inbound foreign direct investment into China surpassed \$100bn for the first time, and investment overseas by Chinese companies in non-financial sectors totaled \$59 billion. The country's per capita GDP (PPP) is \$7,518 (IMF, 93rd in the world) in 2010.

In the aftermath of the global financial crisis (2007-2008), the Chinese Government has started a policy of promoting the internationalization of its currency, the RMB, also known popularly as the Yuan. The crisis showed policymakers in Beijing how overly dependent China export industry is on the use of the dollar as the currency of settlement in international transactions. To avoid this, policymakers in Beijing have decided to promote the use of the RMB in international trade. Since the global financial crisis China has developed a multi-phase and multi-track strategy to make the RMB a reserve currency a la par to the dollar and the euro. In 2000 the RMB circulation in neighboring countries and regions, the expansion of China's WTO accession process and promote China-ASEAN Free Trade Area the internationalization of the RMB rise to national decision-making and domestic attention from theorists.

The aim seems only too logical; that the second biggest economy in the world wants to promote its currency is perfectly understandable. Whether China wants to play a bigger role in the International Political Economy (IPE), it needs greater autonomy in international monetary affairs, and what better way to achieve this than to use its own currency in international transactions. As Charles Kindleberger argued, "a country's exchange rate is more than a number. It is an emblem of its importance to the world, a sort of international status symbol". Similarly, Robert Mundell declared that "great powers have great currencies" (Kirshner 2003:15, both quotes). Hence, if China aspires to become a great power in the foreseeable future, it needs to raise the profile of its currency. Nevertheless, this is easier said than done, making ones currency global is certainly not an easy task.

China has some of the surrounding residents as a medium of exchange and RMB means extensive use of the BIS, which is based on China's economy strong and steady growth, and brought by the economic strength and strong stability of the RMB. The RMB in neighboring countries and regions, a large number of circulations, it is the result of market needs and choices, vote for China's development is a 'vote of confidence. "Although the circulation of RMB outside does not mean that the RMB has been internationalized, the RMB in circulation outside the combined with the relevant policies of supporting the expansion would lead to the internationalization of the RMB.

By speaking about the origin and basic concept of the internationalization of the RMB, Tse Yung-hoi, deputy chief executive of BOC International and president of the Chinese Securities Association of Hong Kong, first give it a definition, means taking the RMB outside of China and allowing nonresidents to hold the RMB extensively overseas and use it as a currency for routine payments, settlements, investments, and reserves. The process of internationalization of RMB benefits,

constraints and proposals is a problem of this article.

## 2 Benefits of RMB Internationalization

The potential benefits of internationalization of the RMB are obvious. First, it would reduce the exchange rate risk facing Chinese firms: (i) internationalization of the RMB means that more foreign trade and financial transactions would be invoiced and settled in the RMB, hence the exchange rate risk for Chinese firms would be reduced accordingly, although demand risk would remain; (ii) the increase in the weight of RMB-denominated assets in financial institutions would reduce the impact of foreign exchange risk in the computation of the BIS capital adequacy requirements; (iii) the risks associated with foreign currency denominated funds would also be reduced; and (iv) an internationalized RMB would make it possible to tackle the problem of “original sin” which many emerging economies have to live with.

Second, the internationalization of the RMB would improve the funding efficiency of Chinese financial institutions, thereby greatly increasing their international competitiveness, because they would enjoy the advantage of having easier access to the vast pool of RMB assets. That competitiveness would, in turn, promote the expansion of China’s financial service sector. Although internationalization of the RMB is not a necessary condition for establishing a financial centre in China, it would greatly help the Endeavour.

Third, internationalization of the RMB could boost cross-border transactions: (i) the cross-border flows of the RMB brought about by real economic activities such as cross-border trade and travel could provide an effective settlement method in bilateral transactions; and (ii) it could also enlarge bilateral trade and economic cooperation and promote the economic development of frontier regions inhabited by minority nationalities.

Fourth, internationalization of the RMB means that the RMB would be held by non-residents, which would allow the Chinese monetary authority to collect seigniorage from the rest of world. Seigniorage is the margin between the denomination of the notes and the cost of issuing the notes obtained by the note issuer. Issuing a world currency is equivalent to levying seigniorage on other countries. Although China does not have the goal of collecting seigniorage at some point in the future, the internationalization of the RMB could at least offset, to some degree, the seigniorage that China has to pay to the United States.

Lastly, internationalization of the RMB could help China to preserve the value of its foreign exchange reserves. China is the biggest holder of foreign exchange reserves in the world. However, all its foreign exchange reserves are denominated in foreign reserve currencies, of which more than 70% in the US dollar. If China’s claims on the United States were denominated in the RMB, China would not need to worry about the possibility of suffering huge capital losses on its foreign exchange reserves as a result of the US government’s debasing of the US dollar. Currently, because the United States owes China more than USD 1 trillion in US dollar-denominated debt, it can easily inflate away its debt burden. China is at the mercy of the United States.

### 2.1 Comprehensive analysis of the benefits of the RMB Internationalization

#### 1) Help enterprises avoid exchange rate risks and promote development of foreign trade

In international trade and investment activities will be reduced by the use of RMB exchange rate risk, and promote China's international trade and investment. The rapid development of foreign trade, foreign trade enterprises hold large amounts of foreign currency claims and liabilities. Higher risk due to currency exposure, exchange rate fluctuations will have business impact. Internationalization of the RMB, the foreign trade and investment can be denominated in national currency and settlement risks faced by the enterprises will follow reduce the exchange rate, which could further promote China's foreign trade and investment.

#### 2) Reduce the demand for foreign exchange reserves to maintain financial security

As the RMB non-convertible currency, import and export enterprises in China and other activities basically have to use the dollar, euro and Japanese yen and other key currencies, in order to maintain the RMB exchange rate stability, foreign payments to meet the needs of China must hold a certain amount of foreign exchange reserves to intervene in financial markets, to ensure the payment of foreign trade and investment activities. If the RMB as an international currency, the Yuan can be used for external payments, the RMB issue is China's monetary authorities can control, and then to a certain extent can reduce the amount of foreign exchange reserves holdings.

#### 3) Reducing the pressure of RMB appreciation eases the situation of excess liquidity in China

Since 2002, China's international balance of payments surplus for years, the appreciation of the RMB has been facing pressure because basically China's balance of payments surplus held in the form of foreign exchange in case of appreciation of the RMB, within the body tend to hold foreign exchange choose foreign exchange, foreign exchange to some extent exacerbated the situation of excess liquidity. If the RMB an international currency, domestic enterprises can payment RMB, while the RMB can be used as foreign investment, foreign currency loans and other countries reserve currency, the RMB by other countries to absorb liquidity, not only can reduce the pressure of RMB appreciation, but also help ease the situation of excess liquidity.

4) To obtain international seigniorage income

Seigniorage refers to the issuer by virtue of the privilege of issuing currency notes received and issued notes denominated in the difference between the cost issues. In its issue of notes, taken from the country should be used on their own, and issuing international currency is equivalent to levy seigniorage from other countries, such income is basically no cost.

5) The RMB has become an important international currency will change the pattern of the International Monetary System.

Internationalization of the RMB will not only help change the current international monetary system, increase the reserve currency of competition and restraint mechanisms, will help stabilize the global financial system. China as a developing country, its legal currency - the RMB as an international currency, will change the pattern of the international monetary system, making the developed countries dominate the world economic and financial situation change. The RMB as an international currency, international monetary system will gain a place in developing countries, is conducive to safeguarding the interests of developing countries.

6) To improve China's global influence of macroeconomic policy and international affairs, the right to speak.

The RMB as an international currency, will make China's exchange rate policy more international, and may result in some developing countries to peg the RMB's exchange rate policy. These are both the exchange rate of China's monetary authorities to control the level of ability and test of the international community on China's political and economic power of recognition. Internationalization of the RMB, China's macro-economic policy-making will also cause some other countries, the external economic development impact; with other countries on macroeconomic policy coordination is a must. Meanwhile, the internationalization of the RMB, China will assume certain tasks of international financial stability, when the international financial markets under attack, the Chinese have a large image of the country there, if necessary, should serve as a regional lender of last resort role, which will help improve China's international influence.

7) To promote China's financial institutions and international financial markets

As the Chinese financial institutions to conduct RMB business advantages, if the RMB internationalization, the outside of RMB loans, settlement demands, which will help Chinese financial institutions to "go out" to promote Chinese-funded financial institutions an international scale. In addition, foreign investment of RMB funds it needs a place, thus allowing the RMB back to foreign markets is China's financial system design and the practical needs of the integration point, the return of non-resident holders of RMB investment will promote China's financial market liberalization and internationalization.

### **3 Constraints of RMB Internationalization**

Currently the RMB in the international monetary system's status with China in the international community's political and economic status did not match, the RMB is not convertible for capital projects, not the international community generally accepted currency, many domestic scholars have called on the government should take active measures process of internationalization of the RMB but the internationalization of the RMB is not a consultation and on, but a gradual and dynamic process, the RMB's rising national credit process, because other countries and the increasing demand for the RMB to be satisfied in the process. From the current domestic situation, the internationalization of RMB in its infancy, there was a not only favorable condition; the future must face many challenges and risks.

From the actual conditions of the RMB and external environment analysis, the RMB as an international currency will be the trend of historical development, however, the RMB as an international currency obstacles remain, from the current situation analysis, the internationalization of RMB is still on the road there are many negative factors:

### **3.1 RMB capital project is not yet fully convertible**

The RMB to achieve the international, the fundamental requirement is the RMB fully convertible under the capital account, which allows freedom of Chinese citizens and businesses will be converted to other currencies, the RMB, non-residents can freely convert foreign currency into RMB. Because, holding a can not freely convertible currency at higher risk, thus holding costs are high, competition is bound in the money at a disadvantage, it is difficult to become an international community generally accepted international currency.

#### 1) RMB non-residents to obtain a narrow channel

According to "cross-border trade in RMB clearing pilot management" and its Implementing Rules and Regulations, the RMB settlement of cross-border trade under, foreign agents can set up foreign exchange correspondent accounts in foreign ways BEDDING funds, or by other means from the financial account RMB domestic bank financing.

#### 2) The inertia of transaction payment habits

Over the years, developed an international selection of international trade between the exporting country's currency is denominated settlement of trade between developing and developed countries generally use the advanced settlement of international currencies, payment of such transactions has become a habit, if the change this payment habits takes time, so there is bound to the RMB settlement of the growing acceptance of the process.

#### 3) Non-residents the lack of use of the RMB channels

RMB non-residents to obtain or hold cash, or used in the pilot cities to buy Chinese goods, the lack of use of other channels, and converted into other freely convertible currency higher costs, which to some extent, affected by non-residents willingness to hold the RMB

### **3.2 The spread between the RMB and foreign currency and RMB strong currency situation negatively affected the non-residents**

For a long period of time, the RMB appreciation trend of reducing the non-resident demand for RMB liabilities, non-residents by increasing the outflow of liabilities means there are certain difficulties for RMB. From a financial point of view of cost, people are always willing to reduce hard currency debt, increase hard currency assets, while the state of the RMB in a strong currency, China's foreign loans or foreign institutions to issue RMB bonds and other ways to increase the output of non-resident liabilities of RMB difficult, because, liabilities to non-resident holders of RMB revaluation losses suffered.

In the process of internationalization of the RMB, but also facing this problem, namely RMB assets attractive to non-residents, but has rarely been interested RMB liabilities, because the borrower may face due to the appreciation of the RMB exchange rate risk. To obtain more foreign enterprises is RMB funds obtained from the first Chinese exports of RMB funds, then people with money to pay for Chinese imports, the income and expenditure for the period, there is a need to invest RMB assets in the market.

#### 1) The lack of response for non-residents of RMB exchange rate risk of financial instruments

People's Bank of China and the Administration of Foreign Exchange issued to allow domestic institutions to handle the exchange rate swaps and other hedging long-term financial transactions are for the residents, rather than a lack of positions held by residents of the RMB exchange rate hedging instruments, the RMB in the case of a strong currency non-resident holders of debt and lack of RMB revenue in the future to return the RMB to purchase foreign exchange liabilities, exchange rate risk clearly exists, therefore, outside the NDF products have to survive.

#### 2) RMB Internationalization may lead to the exclusion of even the developed countries jointly resist

China has been achieved with the Western powers international currency, there was not only ideological differences, but also there is conflict of economic interests, the United States will not easily give up the dollar hegemony, with Japan, the United Kingdom formed the political and economic alliance and the euro area countries will maintain the vested interests and established the pattern, is likely to take measures to stop the process of internationalization of the RMB. In addition, the International Monetary Fund (IMF) initiative by the United States control, the United States can not easily give up the dollar in international currency status, the adoption of the proposed super-sovereign reserve currency. Russia, India and other emerging market economies have their own interests, but also urged the free convertibility of their currencies and international currency, the RMB internationalization must exist between certain conflicts of interest and cooperation.

#### 3) Opening up China lacks a certain breadth and depth of financial markets

The internationalization of RMB regionalization of RMB output area is a surplus countries of China, China's exports to these countries receive the RMB, while the value of the RMB relative stability

of the RMB assets are attractive, the key is China can provide a suitable offshore RMB back channels and invest. China's financial market is currently open only by QFH form, QFH total degree is only \$ 30 billion, and QFII not mind the return of funds outside the channels of the RMB. In addition, China's financial markets and limited government bonds and financial bonds, the balance of the term structure of the unreasonable high short-term debt security bond amount is limited, the lack of a certain breadth and depth of financial markets is not conducive to investment in domestic outflow of RMB bond market way back.

### **3.3 Implication for monetary policy as the risk of RMB Internationalization**

The policy implications of internationalization of the RMB are difficult to address for three reasons. First, it is always difficult to distinguish the impact of currency internationalization on monetary policy from that of other factors, such as the development of financial markets, the liberalization of financial sectors and increasing trade and financial integration. Second, although it is assumed that currency internationalization impacts on monetary policy mainly via its impact on the monetary policy transmission mechanism, a sound and well established analytical framework is still absent. Third, the RMB is far from being an international currency, and its use internationally and regionally is still very limited. Hence, the absence of data makes it difficult to discuss the relationship between the not-yet internationalized RMB and China's monetary policy. As it is difficult to carry out an empirical study and draw reasonable implications from statistical findings, the discussion on this subject is mainly conceptual.

First, internationalization of the RMB would stimulate the development of direct finance by increasing its private usage in bond and other debt securities and equity markets, which would bring about a quicker adjustment of market interest rates to the changes in official interest rates. This is because a more liquid and sophisticated financial market would be created following the enlarged usage of RMB financial instruments.

Second, internationalization of the RMB would stimulate arbitrage activities in response to monetary policy changes. In the case of monetary tightening, an interest rate hike would cause currency appreciation, given the free flow of capital across the border. If the interest rate or spot exchange rate deviate from the anticipated interest rate and exchange rate, or the real exchange rate deviates from the nominal exchange rate - which, in the case of monetary tightening, is presumed to be favorable for the holding of RMB assets - international investors would carry out interest arbitrage by buying more RMB assets. Again, the intensity of the effects of interest arbitrage depends on the degree of flexibility of the interest rate and exchange rate, and on the extent of capital account liberalization.

Third, internationalization of the RMB could also have an impact on the effectiveness of monetary policy via wealth effects. A decline in the official interest rate aimed at stimulating investment spending would induce a hike in asset prices by increasing the earnings from the holding of RMB assets. Correspondingly, the market value of firms would go up, which would give firms greater incentives for investment spending. International use of the RMB would thereby allow extra funds to flow into the RMB equity market, and hence enlarge the wealth effects of loose monetary policy.

Fourth, internationalization of the RMB would result in currency substitution and an increase in RMB deposits in third countries. There are no clear-cut theoretical explanations to confirm whether currency substitution and an increase in RMB deposits in third countries would have an impact on money demand. There might be different outcomes, depending on whether the increase in holdings is made by non-residents or by residents in third countries. For non-resident holdings, there might be a weak link to money demand, but for resident holdings outside China, the impact of changes in RMB holdings on the stability of money demand could be significant.

Lastly, another factor that needs to be considered is the likelihood of the growth of the euro-RMB market. It's difficult to quantify the risks, and hence the net effect, of currency internationalization. Furthermore, external factors are equivalently important when considering the rationales for internationalization of the RMB. In other words, for internationalization of the RMB, whether other countries are willing to accept the RMB in international transactions for both private and public purposes is as important as whether China wishes to internationalize its currency.

## **4 Proposals of RMB Internationalization**

### **4.1 The goal of internationalization of the RMB**

Goal is through the internationalization of the RMB, China can get rid of the international monetary system in the weak position, obtained with considerable political and economic strength of the

currency of great power status, China from both the international seigniorage, foreign economic organizations as well as lower domestic activities of the exchange rate risk, thereby contributing to the continuing healthy development of China's economy. Around the objective of promoting the internationalization of the RMB's overall strategy is: adhere to the "two legs" to walk; first use of Chinese and Southeast Asian countries trade advantage, advance RMB regionalization process; second is to use a variety of ways to promote the RMB in the international financial circulation on the market. To this end, the geographic expansion on "three steps" to promote the process of internationalization of the RMB, which upholds the periphery of the RMB to RMB regionalization and to develop international; at the same time, insist on the functional currency RMB, RMB investment and borrowing and simultaneous development of the official reserves of RMB strategy. In this process, and steadily promote the process of capital account convertibility of RMB, actively and steadily carry out RMB offshore financial services, timely and appropriate to promote the gradual and orderly process of internationalization of the RMB.

Specifically, the path of internationalization of the RMB arrangements are: first, to promote the development of regionalization of RMB, the RMB in the Asian region to promote international trade, foreign direct investment, international borrowing in use, and by non-residents to issue RMB bonds and stocks, etc. and to allow non-resident holdings of RMB products to expand the territory of China's financial market opening, the RMB to become one of the key currency in Asia, and gradually from the regional to international development. In addition, the dollar and the euro in response to competition, strengthen regional monetary cooperation, efforts to promote the RMB as a regional common currency of the main part of the organization.

As an international key currency is the main means of exchange, unit of account and store of value of currency. International monetary system is not a perfectly competitive market, many countries do not have the conditions of competition, therefore, these countries often adopt the currency peg or directly with the key way. Three conditions of the currency can be called a key currency:

- 1) Balance of payments in one currency most used;
- 2) The largest share of foreign exchange reserves of a currency;
- 3) Generally accepted international currency.

Second, the RMB internationalization and capital account convertibility, pressed forward and promote each other, without waiting for the realization of capital convertibility of the RMB and then promote the internationalization of the RMB; third is denominated in the RMB as settlement currency in international trade, international investment and international borrowing currency, the RMB a non-resident holdings of financial products on the Chinese market or in China to issue RMB-denominated bonds and stocks can advance in time, no need to distinguish the order; fourth, through various channels to promote the outflow of RMB and the establishment of offshore capital back institutional arrangements.

Although the RMB an international currency is the result of market choice, but choice and China's political and economic power is closely related to policy design.

#### **4.2 China's increasing importance in the world economy**

After 30 years of reform and opening-up, China has become one of the most dynamic economies in the world. Furthermore, according to an analysis based on a GTAP simulation: by 2025, China's share in global GDP will increase from 5% to 11.6% (assuming 20% growth in total factor productivity (TFP)), overtaking Japan's share and enabling China to become the third largest economy in the world. The other two scenarios show that even a lower growth rate of TFP does not significantly change the results. For instance, under the assumption of zero TFP growth, China's GDP share would be slightly below that of Japan by 2025, which would allow China to remain the fourth largest economy in the world. The growing size of the Chinese economy will be strongly supportive of the RMB playing an ever bigger global role.

## **5 Conclusion**

This article concluded that:

- 1) As a political and economic power, the RMB internationalization is necessary and urgent;
- 2) The internationalization of the RMB has to have certain conditions, the current time is right;
- 3) The Chinese government in the process of internationalization of the RMB to view the important role of government policy measures need to be taken to push dynamic process of internationalization of the RMB, RMB settlement of cross-border trade, foreign investment and international borrowing can be

synchronized carried out;

4) In a variety of sources, while the RMB, to be orderly opening up the domestic financial market, the establishment of offshore RMB back channels, in order to continue to promote the internationalization of the RMB;

5) The internationalization of the RMB in capital cases is not fully open to promote capital account convertibility and RMB internationalization process and promote each other, but the advanced stage of internationalization of the RMB of capital to be required account convertibility;

6) Both the internationalization of the RMB gains are at risk, need to take measures to minimize risk.

Finally, the internationalization of the RMB, China must first proceed independently at its own speed and promote RMB internationalization step by step. Second, China shouldn't allow rapid RMB appreciation tomorrow just because Western countries demand this today. China should act according to the development of its own economy. So, as a third point, China must establish a good currency backflow mechanism. The fourth point is how to develop Hong Kong into a well-rounded offshore center for RMB receipts, payments, settlements, investments, and reserves when China's capital markets are still not open. As an offshore center of the RMB, Hong Kong acts as a firewall for RMB inside China and also as a trial entity in its promotion of the internationalization of the RMB.

In conclusion, the RMB internationalization is a real long and complicated process, but in the process is full of risks and challenges, only to have every aspect to consider carefully the risks and take measures to prevent and resolve, to the internationalization of the RMB stable advancing.

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# Study on SaaS Management Decision-making for Industrial Cluster Based on AHP\*

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**Abstract:** Aiming at the problems existing in the study on SaaS management decision-making for industrial cluster, especially on the incompletely index system and the lack of quantitative research in qualitative indicators, this paper constructs a complete SaaS management decision-making index system for industrial cluster, and introduced AHP to calculate the index weight, and then take advantage of Shahe glass industry as an instance to collect data. Finally come up with three indicators that decision makers should first take into consideration: IT operation costs, security, hardware and software costs.

**Keywords:** SaaS; Decision-making; Industrial cluster; AHP

## 1 Introduction

As a use of software business model through internet, SaaS(Software-as-a-Service) is most widely used in enterprise applications, and it's the best carrier of information in industry clusters, which are associated with strong economies of scale and a high regional concentration. Since now a number of SaaS application platforms have been on the line, such as Suzhou Industrial Park, "Storm Riders Online", Wuxi city of China SaaS platform and so on.

SaaS Management decision-making now mainly focused on technical implementation and optimization. Based on the resources of the Web services architecture, Goscinski and Brock (2009) studied the dynamic SaaS service discovery and selection model by measuring the current state of the SaaS dynamic attributes of resource characteristics to select the right SaaS service<sup>[1]</sup>. Godse and Mulik studied the users' choice to buy under homogeneous SaaS market environment, and designed five first level indicators including features, architecture, ease of use, reputation and cost, as well as 16 secondary indicators to establish decision model of the users when they buy SaaS products.

The existing research nowadays is usually for a single enterprise, neither analyzing from the perspective of industrial cluster, nor considering the government's policy. Therefore, this article uses the Analytic Hierarchy Process(AHP) to analyze the elements that affect SaaS management decision-making, and designed three first-level indicators and thirteen second-level indicators to take Shahe glass industrial cluster as an example of quantitative model as the basis of SaaS management decision-making.

## 2 The Process Steps of AHP

### 2.1 Definition and principles of AHP

The AHP was first proposed by a famous American professor Satty and his associates in 1970s. It's a decision-making method which combines qualitative and quantities analysis together<sup>[2]</sup>. Its principle is to decompose a complex problem into several orderly levels, and then experts make judgment by comparing the importance of each element and offer an order from the best to the worst to help making decisions.

### 2.2 Establish a hierarchical model

According to different objectives or different functions, the system is firstly divided into a multi-level hierarchical structure. The highest level is generally the target layer; while the intermediate level general criteria layer; and the lowest level is usually a variety of measures or decisions to solve problems.

### 2.3 Establish a judgment matrix

Compare the importance of elements on the same level to the previous level and establish a judgment matrix. Assume that there is a domination relation from element y to elements  $x_1, x_2 \dots x_n$  in

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the next layer to establish a judgment matrix A (aij) n × n. aij represents the degree of influence of elements xi and xj on the target y. The value of Aij is always between the Satty gradations, shown in Table 1:

**Table 1 Satty Gradation**

<i>xi/xj</i>	Least important	Less important	important	More important	Absolutely important
<i>aij</i>	1	3	5	7	9

Note: the number 2, 4, 6, 8 living between two adjacent judgments.

**2.4 Calculate the sort weight vector**

The sort weight vector combines by the relative importance (i.e. weight) vectors a level factor relative to the previous level factors. The most common and practical method to compute weight vector is the square root method. The process is as follows:

(1) Calculate the product of the matrix elements in each row

$$Mi = \prod_{j=1}^n a_{ij}, i=1,2,\dots,n \tag{1}$$

Calculate the n-th root of Mi,

$$Wi = \sqrt[n]{Mi} \tag{2}$$

Normalize W' = [W1, W2, ... Wn]<sup>T</sup>,

$$Wit = \frac{Wi}{\sum_{j=1}^n Wj} \tag{3}$$

Then W = [W1t, W2t, ... Wnt]<sup>T</sup> is the target matrix.

(2) Calculate the largest eigenvalue of the judgment matrix,

$$\lambda_{max} = \sum_{i=1}^n \frac{(AW)_i}{nW_i} \tag{4}$$

(AW)<sub>i</sub> is the ith element of Vector (AW).

**2.5 Inspection consistency**

If the experts' judgment cannot be coordinated, it may lead to conflicting results. It's necessary to introduce two indicators: the general consistency index

$$CI = \frac{\lambda_{max} - n}{n - 1} \tag{5}$$

and the average consistency index RI. RI is a constant. Referring to 1 to 9 order of the judgment matrix, the corresponding values of RI are shown in Table 2. If CR = CI / RI < 0.10, it means the judgment matrix is with acceptable consistency. Otherwise, it needs to be adjusted until with a satisfied consistency.

**Table 2 The RI values of random index**

order	1	2	3	4	5	6	7	8	9
RI	0.00	0.00	0.52	0.89	1.12	1.26	1.36	1.41	1.46

**2.6 Sort decision-making**

When calculated the relative weights of the factor to the previous level, we need to have a combination of these weight from the top to the bottom. The combination operation is actually a multiplication with the weight of each factor. Then we can come out with the total level sort from the relative merits of sort value. Finally we can make decisions or choose options from the value of each weight.

**3 An Instance Application of Shahe Glass Industrial Cluster**

Shahe city is known as the "Glass City" reputation, and has formed its own industry cluster with a 15-billion-yuan scale of economy. So rapid the development of its industry cluster, its e-commerce is still in infancy, neglecting the constructing of an e-commerce website from a point of their own information needs and the trend of glass industry chain. So it plans to establish a public service platform to support the development of its industrial cluster.

**3.1 The SaaS management decision-making model of Shahe glass industrial cluster**

TCO (total cost): the cost advantage of SaaS is an important aspect to attract companies. It mainly includes the following four parts:

- 1) IT operation costs: the costs of users rent online cloud service;
- 2) Business operation costs: the hidden costs when SaaS is implemented;
- 3) Hardware and software costs: including all hardware, software, network storage, database and system upgrade, training and management costs;
- 4) Other intangible costs: including opportunity costs and other costs.

QoS (quality of service): 1) Ease of Use: the service can be successfully visited by the user at the appointed hour and under an appointed condition;

- 1) Reliability: the ability of suppliers that providing users with stable and unmistakable service;
- 2) Responsiveness: the ability and speed of suppliers when then solve problems;
- 3) Efficiency: the ease and speed of users when they visit the website;
- 4) Integration: the good integration capabilities of service and applications;
- 5) Security: the safety of information transmission and storage, including technical security and credit security.

Government-oriented Fiscal Policy (GFP): a) Financial policy; b) Tax policy; c) Laws and regulations.

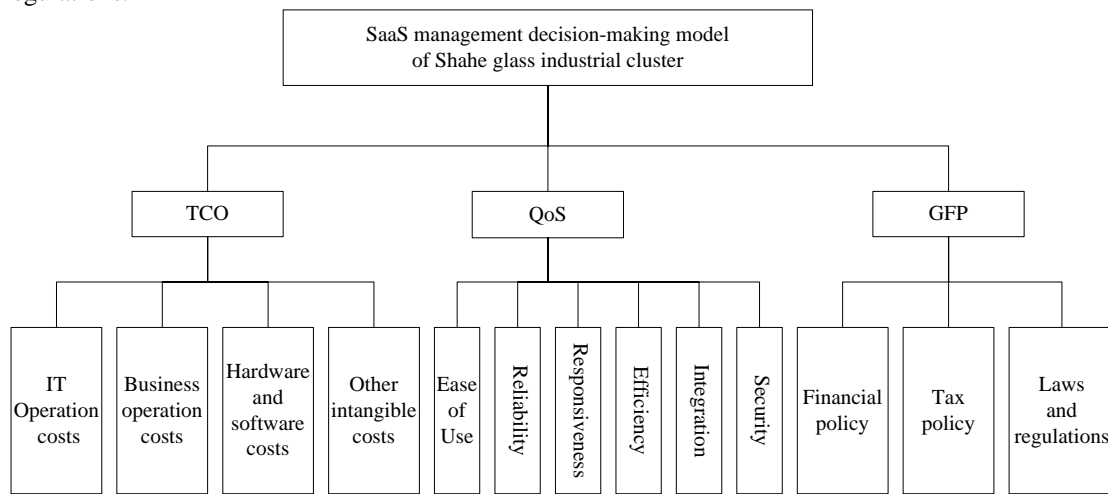


Figure 1 SaaS Management Decision-making Model of Shahe Glass Industrial Cluster

**3.2 Form a judgment matrix and calculate the sort weight vector**

According to the views of experts, the judgment matrix is formed as follows. Then calculate the weight of each indicator and test the consistency, showed in Table 4.

Table 3 The judgment matrix A-B

Target A	B <sub>1</sub> : TCO	B <sub>2</sub> : QoS	B <sub>3</sub> : GFP	W
B <sub>1</sub> : TCO	1	2	4	0.5584
B <sub>2</sub> : QoS	1/2	1	3	0.3196
B <sub>3</sub> : GFP	1/4	1/3	1	0.1220

CR=0.04517 < 0.1

Table 4 Weights of each attributes

	Criteria weights	Sub-goals	Sub-weight	Total weight
TCO	0.5584	C <sub>1</sub> : IT operation costs	0.2197	0.1227
		C <sub>2</sub> : Business operation costs	0.0857	0.0479
		C <sub>3</sub> : Hardware and software costs	0.1936	0.1081
		C <sub>4</sub> : Other intangible costs	0.0309	0.0173
QoS	0.3196	C <sub>5</sub> : Ease of Use	0.0787	0.0252
		C <sub>6</sub> : Reliability	0.0863	0.0276
		C <sub>7</sub> : Responsiveness	0.0534	0.0171
		C <sub>8</sub> : Efficiency	0.1539	0.0492
		C <sub>9</sub> : Integration	0.0985	0.0315

		C <sub>10</sub> : Security	0.3387	0.1082
GFP	0.1220	C <sub>11</sub> : financial policy	0.0273	0.0033
		C <sub>12</sub> : Tax policy	0.0756	0.0092
		C <sub>13</sub> : Laws and regulations	0.3479	0.0424

$$CR_3=0.0520 < CR_2=0.0697 < CR_1=0.0843 < 0.1$$

### 3.3 Sort decision-making

The order of the weight of each influencing factor is: C<sub>1</sub> > C<sub>10</sub> > C<sub>3</sub> > C<sub>8</sub> > C<sub>2</sub> > C<sub>13</sub> > C<sub>9</sub> > C<sub>6</sub> > C<sub>5</sub> > C<sub>4</sub> > C<sub>7</sub> > C<sub>12</sub> > C<sub>11</sub>

### 3.4 Result analysis

We can see from the order that C<sub>1</sub>, C<sub>10</sub> and C<sub>3</sub> are the three most important factors. So when making SaaS management decisions, decision-makers should think these three factors first in order to try to cut down the IT operation costs, Hardware and software costs and to ensure security of SaaS. According to all the indicators considered above, C<sub>11</sub> and C<sub>12</sub> are the least important. In order to improve the quality of management and use resources effectively, the decision-makers should consider less about tax and financial policy.

## 4 Conclusion

Based on the comprehensive analysis through current study about SaaS management decision-making for the industrial cluster, this paper: 1) establishes an evaluation system facing Shahe glass industrial cluster, which includes 3 first-level indicators and 13 second-level indicators; 2) introduced AHP to calculate the index weight and to determine the relative importance of each indicator to the decision-making target; 3) establishes a quantitative model of the qualitative indicators, and collected relative data to help make a right choice. The decision-making is based not on the subjective judgment but the reference data, in a more scientific and rational way.

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## A Motivation Mechanism on Disposing Non-Performing Bank Assets

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**Abstract:** The non-performing assets' liquidating proportion and transfer price are bank's two important problems of disposing the non-performing assets, which are discussed by a model in this article. For the bank's liquidating proportion of non-performing assets, the government's different stimulus policy will produce a moral hazard and cause a welfare loss. The non-linearity transfer price of the non-performing asset is the bank's most affordable way of capital structure reconstructing without distorting the bank's incentive mechanism.

**Key words:** Commercial banks; Non-performing asset; Incentive mechanism; Non-linear transfer price model

### 1 Introduction

The transformation of banking system is the core content of the economic transformation, and is the key factor related to the succession of economic transformation. But in the banking system, a large number of non-performing asset has threaten financial economic security seriously. how to encourage state owned bank's managers to open their non-performing asset's proportion and in what price to liquidate the non-performing asset becomes the key of bank system's transformation. This article constructs a simple model to discuss, then analyses how managers will react and how many welfare lost ,when the government use different policies of restructuring capital structure, further, analyses that the non-linear transfer price may be the bank's cheapest way to reconstruct capital without distorting the incentive mechanism.

### 2 Model Introduction

Assuming that the bank's total assets is 1, which includes one asset in proportion of  $b$  that will produce return rate of  $R_f$  in the first period, and the other asset accounted for  $(1-b)$  does not produce any profits. For existing period of asset accounted for  $(1-b)$  that does not produce any earnings, include one asset in proportion of  $k$  which will produce return rate of  $R_p$  in the second period, and the other asset accounted for  $(1-k)$  does not produce any gains. When only liquidate assets which accounted for  $(1-b)$ , but is not extend period, the produced liquidation return rate defined  $L$ . At the same time, we also must assume that:

$$R_f > R_p > 1, \quad (1)$$

$$0 < L < 1, \quad (2)$$

$$\text{and } kR_p + (1-k)L < 1, \quad (3)$$

That is to say, the expected return rate of non-performing is less than 1, and expected earning is negative. Therefore, the bank's optimum choice is to extend period for assets of the proportion is  $k$ . For assets the liquidation proportion is  $(1-k)$ , the biggest return it can obtain is  $kR_p + (1-k)L$ .

Assuming that  $b$  can take two possible values  $b_1$  and  $b_2$ , each has probability rate of  $P_1$  and  $P_2$ , and  $b_1 > b_2 \geq 0$ . Considering the initial assets value 1, the bank's net value condition depending on the value  $b$  defined by following formula

$$U_i = b_i R_f + (1-b_i)[kR_p + (1-k)L] - 1 \quad (4)$$

From  $b_1, b_2$ , it can be seen that  $U_1 > U_2$ , and assuming that  $U_1 > 0, U_2 < 0$ . If the bank does not cheat, liquidation asset ratio will be  $d_i = (1-k)(1-b_i)$  in this two condition.

### 3 Moral Hazard of Disposing Non-Performing Assets

Assuming that the government can't see high quality assets of the proportion of  $b$  in the bank's balance sheet, but can see the number of liquidation asset, so making capital structure's recombination depends on the liquidation policy. The bank can be able to change the  $d_i = (1-k')(1-b_i)$  ( $k'$  is the bank's selective variables and can distort the liquidation decisions). After the bank disposal non-performing asset according to its own selective variable  $k$ , it's asset's continuity value is as following:

$$V = \min \{k, k'\} R_p + (1-k')L \quad (5)$$

1) when the  $k' > k$ , the bank manager narrows the proportion of non-performing asset, that is, assets

excessively continue, the return rate of disposing the non-performing is  $kR_p + (1-k')L$ . Because the assets of part  $(k'-k)$  do not get the liquidation value, the disposal loss of the excessive extended period assets were  $(k'-k)L$ .

2)when the  $k' < k$ , the bank manager exaggerates the proportion of non-performing asset, that is, assets excessively liquidated, the return rate of disposing the non-performing asset are  $k'R_p + (1-k')L$ . Because the asset of part  $(k-k')$  are liquidated ,but didn't extended, the disposing loss of excessive liquidation asset is  $(k-k')(R_p-L)$ .

Now to analyze the moral risk and welfare loss, caused by after the government carrying out different incentive policies of disposing non-performing assets, and the bank manager adopt corresponding countermeasures.

3)If the government implement strict capital reconstruction policies, that is , if the bank manager announced  $U_1 < 0$ , he will be fired. Assuming that the government can't see high quality assets of the proportion of  $b$  in the bank 's balance sheet , only see the number of liquidation asset. In this case, the moral risk will arise, bank managers will intentionally declare the  $U_1$  which actually  $U_2$  happens, and liquidate less project than actually need more . Because the banks announces  $U_1$  , the government can supervise the ratio of clearing non-performing assets is  $(1-k)(1-b_1)$ , but in state 2, the bank's actual liquidated the assets ratio were  $d_1 = (1-k')(1-b_2) = (1-k)(1-b_1)$ . From  $b_1$  and  $b_2$ ,  $k' > k$ , excessive extended period will appear.

4)If the government implement soft capital reorganization policies, that is, when the bank manager announces  $U_1 < 0$ , he won't be fired, and may even earn profit from excessive reconstructing. In this case, the moral risk also will exists, bank manager will intentionally announce  $U_2$  which actually  $U_1$  happens, resulting in excessive liquidation. Because the bank announce  $U_2$ , so the government can supervise the ratio of clearing bad assets is  $(1-k)(1-b_2)$ , but in state 1, the bank' actual ratio of capital liquidation is  $d_2 = (1-k)(1-b_1) \equiv (1-k)(1-b_2)$ . Because  $b_1 > b_2$ , get  $k' < k$ , excessive liquidation will appear and welfare loss is  $\lambda/[P_1(U_1-U_2)]$ .

From the view point of welfare, the expected losses caused by tough policy will be  $P_2(1-k)[(b_1, b_2)/(1-b_2)]L$ , and the expected loss caused by soft policy of capital structure reorganization will be  $P_1\{(1-k)[(b_1, b_2)/(1-b_2)](R_p-L) + \lambda(U_1-U_2)\}$ . When the value  $P_1$  is higher , that is, when people think that economic conditions are good, then the strict policy is better; But when people think the economy is in crisis, and the value  $P_2$  is also higher, the soft policy is better.

#### 4 The Transfer Price of Non-Performing Assets

In disposing the non-performing asset, the government introduces cleaning bank as a policy tool. In the above , on the basis of analyzing the proportion of the liquidation ratio of the non-performing asset, now discuss the problem of transfer price of non-performing asset. Under in which conditions that dose banks have incentive mechanism to get rid of the non-performing asset? In other words, what price must to be paid to the bank to make it transfer the assets to the cleaning bank?

Making the price level is  $t$ . Obviously, we must have  $t_1 < R_f$ , so that the bank does not sell off good assets and when  $t = 1$ , the bank will sell bad debt in the initial book value, and can earn profits from good assets. A cheaper price is not only making bank 'net value is positive1 in state 1, but also making it break even in state 2. In general , banks have positive net. Here,  $t$  is the solution of the formula of  $b_2 R_f + (1-b_2)kR_p + (1-b_2)(1-k)t = 1$ .

Now hypothesizing, for bank asset combination  $W$ , set transfer price of assets of share  $m$  is  $t_L$ , the part exceed  $m$  are set  $t_H$ , and the price mechanism has the following characteristics.:

1) In order to avoid the bank to exaggerate the scale of non-performing, there must be:

$$T_H \leq R_p \tag{6}$$

2) In the state 1, the utility of selling bad asset to the government shall not be higher than the utility of liquidating accounts, but can't dare to sell assets to the government,

$$(d_1 - m)t_H + mt_L \leq d_1L \tag{7}$$

3) The transfer price mechanism must allowed the bank to reconstruct capital under state 2:

$$b_2R_f + (1-b_2)kR_p + (d_2 - m)t_H + mt_L \geq 1 \tag{8}$$

Constraint conditions formula(7) and (8) are not linearly related , so if a solution exists, it is not the only one. Using two constraint conditions formula, we can get:

$$(d_2-d_1)t_H \geq 1 - d_1L - b_2R_f - (1-b_2)kR_p \tag{9}$$

Obviously, minimum transfer price that keep the incentive compatible (in making the bank can only transfer its asset which should liquidated) is a non-linear transferred price .This way is actually

restructuring bank assets structure. The intuitive explanation is, through setting low price for part of the portfolio, it may inhibit the bank selling assets in the state 1, then the higher price of remaining part of asset portfolio can be calculated, making the bank Profit and loss balance in state 2, but the premise is the price is not higher than the bank are willing to sell "good part" of non-performing assets.

If the constraint conditions formula (5) and (9) are compatible with each other, there exist solutions. A related selection  $t_H = R_p$  and  $t_L = 0$ ; So, from (7), and we get  $m = d_1 (R_p - L) / R_p$ .  $M$  is the assets boundaries of setting non-linear transfer price. It can be seen, under the above assumptions, the Bank can get the positive net whether in state 1, or in the state 2 through setting the nonlinear transfer price mechanism.

## 5 Conclusions

From the above, we can obtain the conclusion that: if without setting non-linear transfer price incentives, no matter the government carries what incentive measures for the bank restructuring its asset structure, it will still happen moral hazard. In the interest driven, but after setting up non-linear transfer price, the bank can get positive value assets even if it clean up assets. So, the bank is willing to set nonlinear transfer price for reconstructing its assets, and not go against the government's policies of reconstructing assets structure. Visibly, non-linear transfer mechanism may be a feasible way cheap of reconstructing bank's capital structure under the condition of not distorting the bank's incentive mechanism.

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# Factors Influencing Current Coffee Consumption Preference and Behavior in China

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**Abstract:** The hot drinks market of China consists of the retail sales of coffee, tea and other hot drinks. This research focuses on the different factors that are influencing the Chinese current coffee consumption behavior and the reason behind for the preference of coffee from other hot drinks. Survey conducted in Chinese four main cities to identify the different factors which can alter the two main variables. Therefore, the survey proved that the Chinese coffee consumption behavior is positively affected by the availability of quality coffee, use of coffee for socialization, attitude towards coffee and negatively associated by the price of coffee and age. Coffee preference from other hot drinks is influenced by attitude towards coffee, age, education & quality coffee availability and it is negatively affected by price.

**Key words:** Coffee Consumption; Preference Factors; Hot Drink Market

## 1 Introduction

Coffee is an agricultural product growing mostly in developing countries. It is the second most traded commodity in the world after oil. Coffee is produced in more than 50 developing countries providing income for approximately 25 million smallholder producers (DFID 2004; Oxfam 2002b), and employing an estimated 100 million people (NRI 2006). It is consumed almost in all over the world, yet the culture and level of consumption might differ from countries to countries. It's true that the coffee culture is influencing many nondrinking coffee societies, four decades ago Japan had been known as a tea consuming society, the per capita of coffee consumption was less than 300gm currently Japan is listed as a major coffee consumer and their per capita is more than 4 kg.

Coffee and China officially introduced in 1980's. Chinese are much known as a tea drinking and passionate society towards tea not for coffee. However, recently the coffee culture in China is emerging. As mentioned above like Japanese in the 60's and 70's the coffee "revolution" threatening tea in China. For the last ten years the demand for coffee has grown by 70 pc in China. While the demand is growing less than 2 pc per year in the world but in China it is growing by 30 pc. The fast growing westernized middle class Chinese, high number of returnees and ever growing number of expatriates are contributing for the boost of Chinese coffee consumption. In the future, China has the potential to become a major coffee-consuming country. There are approximately 200 million potential coffee consumers in China, which would potentially put China one of the major coffee consumers next to United States (SPR Coffee, 2010).

## 2 Chinese Coffee Consumption Analysis

People worldwide drink a total of 7.4 billion cups of coffee every year, and 20 million cups of coffee are consumed every day. Every coffee drinker drinks an average of 120 cups annually. Coffee beans with a retail value of US\$80 billion are sold each year, which puts coffee second only to petroleum on a list of the top-selling commodities. Average coffee consumption in China is less than one cup per person per year, and consumption is still less than five cups per person per year in urban areas. Annual coffee sales are only approximately ¥4 billion. Despite all these, China's coffee market offers boundless potential. The coffee market is growing by 30% annually. As a consequence, the coffee industry and coffee shop operation represent highly promising blue sea business areas (SPR Coffee, 2010).

The China coffee market has boundless Potential. China's coffee consumer market offers tremendous Promise. China will play a pivotal role in the world coffee industry's in a near future if the growth maintain the same pace.

### 2.1 Overall analysis of the china market

According to statistics, the five million residents of Finland consume a million bags of coffee every year. In contrast, the 1.3 billion residents of China consume only 200-400,000 bags of coffee annually (1 bag = 60 kg). However, in the future China's coffee market offers truly immense promise. The fastest



growing of Chinese Economy (an average rate of 10% per year since 1990), results in an ever growing purchasing power of the People and the big tendency of westernization are the major indicators of the future potential.

**Table 1 Average Cup of Coffee per Capita per Year**

Country	Average Cups of Coffee per Capita per Year
Finland	1,459
Sweden	1,117
Netherlands	1,071
Norway	1,051
Denmark	982
Austria	850
France	735
Germany	731
USA	400
Japan	360
Korea	140
China	5

Source: (SPR Coffee)

According to SPR coffee (2010) there are approximately 200 million potential coffee consumers in China, which would potentially put China as the major coffee consumer just next to United States. In addition, Coffee consumption in China is currently growing at a rate of 30% annually. In contrast, coffee consumption worldwide is growing at an annual rate of only 2%. The Chinese coffee market has grown by 70% in total volume sales between 2003 and 2008 reached 30,000 tones. Euro monitor findings show that, within Asian countries, affluent consumers with a high degree of Western influence are more likely to accept a coffee culture (Hope Lee, 2004). Therefore, all this can show in the future China has the potential to become a major coffee-consuming country.

**Per Capita Consumption Analysis:** The countries of Europe and North America have average per capita coffee consumption in excess of 400 cups annually. Japan's per capita coffee consumption is roughly 360 cups annually. In contrast, Chinese per capita coffee consumption is less than five cups per year. Average annual per capita consumption is only around 20 cups even in such large metropolitan cities like Beijing, Shanghai, and Guangzhou. We may therefore conclude that China's coffee consumer market has enormous room for future growth.

In the other Consumption analysis the retail sales volume of coffee in China was slightly more than 30,000 tons in 2009. This translates to just over 0.02 kg per capita per year. However, it is China's growing urban population of 600 million people that accounts for an estimated 90% of coffee consumption in the country. This would put annual per capita consumption by the target consumer market around 0.05 kg.

Rising consumer income and increasing standards of living, as well as awareness of better-off lifestyles, especially among the growing number of middle-class consumers, have boosted the demand for high-quality products. According to Euro monitor International, fresh coffee, though much more expensive than instant coffee, grew by double digits in both volume and value in 2009, faster than growth for instant coffee. Although there has been a consistent increase in consumption of roasted and ground coffee in recent years, instant coffee still accounts for well over 90% of consumptions, with some estimates as high as 99%. Fresh coffee remains a niche category of the coffee market. This is partly because of relatively high prices and the low penetration of coffee machines in China. But fresh coffee manufacturers are exploring ways to develop the Chinese market. For example, to promote sales of fresh coffee beans, some manufacturers and distributors provide coffee machines free of charge to offices and households.

As such, fresh coffee is primarily consumed by Chinese drinkers outside of the home (in cafés and restaurants) because many coffee drinkers do not know how to brew coffee or do not want to invest in the cost of a coffee machine. There were around 560 cafés belonging to coffee chains in China in 2009, according to Euro-monitor International. Starbucks currently has more than 300 outlets in mainland China. The company has around 400 outlets in Hong Kong SAR, Macao SAR, and Chinese Taipei. Starbucks expects China eventually to surpass Japan to become the company's second largest market in the world.

**Table 2 Per Capita Coffee Consumption in Selected Countries in 2009**

Country	Coffee Consumption (per capita, per annum, kilograms)
Finland	12.0
Norway	9.6
Denmark	8.9
Sweden	8.4
Germany	6.5
Italy	5.8
France	5.3
Brazil	5.3
United States	4.1
Japan	3.4
United Kingdom	2.8
Russian Federation	1.6
Ethiopia	1.4
Mexico	1.1
Viet Nam	0.6
Indonesia	0.5
Chinese Taipei	0.5
India	0.08
China	0.02

Source: ICO Web Site

## 2.2 Trends in coffee consumption 2004-2009

Instant coffee (including 3-in-1, i.e. coffee, sugar and creamer) has always been the predominant form of coffee consumed in China. Base sales of fresh coffee remain relatively low compared to instant coffee, but the trend is toward increased consumption of coffee in this form. Sales of fresh coffee, which includes fresh ground coffee as well as fresh coffee beans, rose by an average of 12% per year from 2004 to 2009. The rate of increase declined by 1%-2% each year during that period, however, the low base sales of fresh coffee make it difficult to forecast whether this trend will continue in the next five years.

## 3 Econometric Analysis of Coffee Preference (CP) and Current Coffee Consumption (CCC) Behavior

An econometric model in general may be written as:

$$y = x\beta + u \quad (1)$$

Where  $y$  denotes dependent variable,  $x$  the vector of relevant explanatory variables including road accessibility determining  $y$ ,  $\beta$  the parameters, and  $u$  the error term to account for unobserved random factors affecting  $y$ . We, however, assume that  $u_i$  is independent of  $x_i$  and  $u_i \sim N(0, 1)$ . Based on the theoretical and empirical framework and nature of data, I specified the estimable econometric models used in the study as follows.

### Model 1: Coffee Preference (CP)

$$y = x\beta + u \quad (2)$$

where  $y$  denotes the dependent variable taking values 0, 1 and 2 if the attitude of a particular respondent toward coffee preference is neutral, disagree (negative) and agree (positive) respectively,  $x$  the vector of explanatory variables including attitude toward coffee, reasonable price of coffee available in the market, and availability of quality coffee in the market determining  $y$ , and  $u$  the error term with  $u_i \sim N(0, 1)$ . Since the dependent variable was ordered, I used the ordered probit model based on random utility in order to investigate the factors influencing the Coffee Preference (CP). An ordered probit model is an extension of a binary probit model. Since it has more than two discrete ordered choices, it is built on a latent regression in the same manner as the binomial probit model. In this case, the ordered probit model can be summarized as follows:

$$\begin{aligned}
 y^* &= x\beta + u \\
 &0 \text{ if } y^* < \alpha_1 \\
 y &= 1 \text{ if } \alpha_1 \leq y^* < \alpha_2 \\
 &2 \text{ if } \alpha_2 \leq y^*
 \end{aligned}
 \tag{3}$$

Where  $y^*$  stands for Coffee Preference (CP) as a latent variable,  $y$  the data we observe,  $u$  the error term with  $u_i \sim N(0, 1)$ , and  $\alpha_1$  and  $\alpha_2$  the cut-off points.

**Model 2: Current Coffee Consumption (CCC)**

$$y = x\beta + u \tag{4}$$

where  $y$  denotes Current Coffee Consumption taking the values 1, 2, 3, 4 and 5 if a particular respondent doesn't drink coffee, drink coffee once in a long time, drink coffee once in a month, drink coffee once in a week, drink coffee every day,  $x$  the vector of explanatory variables including coffee preference (CP), price of coffee (P), quality coffee availability (QCA), attitude towards coffee (AC) and coffee for socialization (CS) determining  $y$ , and  $u$  the error term with  $u_i \sim N(0, 1)$ .

Since the dependent variable was ordered, I used the **ordered probit** model based on random utility in order to investigate the factors influencing the current coffee consumption (CCC). An ordered probit model is an extension of a binary probit model. Since it has more than two discrete ordered choices, it is built on a latent regression in the same manner as the binomial probit model. In this case, the ordered probit model can be summarized as follows:

$$Y = \begin{cases} 1 \text{ if } \infty \leq Y^* \leq \mu_1 \\ 2 \text{ if } \mu_1 < Y^* \leq \mu_2 \\ 3 \text{ if } \mu_2 < Y^* \leq \mu_3 \\ 4 \text{ if } \mu_3 < Y^* \leq \mu_4 \\ 5 \text{ if } \mu_4 < Y^* \leq \mu_5 \end{cases}
 \tag{5}$$

where  $y^*$  stands for Coffee Preference (CP) as a latent variable,  $y$  the data we observe,  $u$  the error term with  $u_i \sim N(0, 1)$ , and  $\mu_1, \mu_2, \mu_3, \mu_4$  and  $\mu_5$  the cut-off points.

**3.1 Factors Influencing Coffee Preference in China (CP)**

To identify the factors that influence Chinese Coffee Preference (CP), it is estimated an ordered probit model with Coffee Preference (CP) as dependent variable and with Attitude toward Coffee (AC), Price (P), and Availability of Quality Coffee (AQC) in the market along with other relevant factors as explanatory variables.

Table 3 the results of the ordered probit model. Attitude toward coffee (AC) and availability of quality coffee in the market (AQC) influence Chinese coffee consumption Preference (CP) positively and price of coffee in the market (P) stress Chinese coffee consumption Preference (CP) negatively.

Attitude towards Coffee (AC) and availability of quality coffee in the market (AQC) influence Chinese coffee consumption Preference (CP) positively but insignificant effect on coffee consumption Preference, and price of coffee in the market (P) stress Chinese coffee consumption Preference had negative but insignificant influence on coffee consumption Preference.

In line with my hypothesis, Coffee Preference significantly influenced by the level of education of the consumers, the research analysis has proved the same. The main reason for this could be, when the Chinese people get more educated there is a tendency to be influenced by the western cultures, fashions and styles. Since coffee consumption is considered as a western culture in China, education will bring openness for westernization.

**Table 3 Results of ordered probit model of Coffee Preference (CP)**

cp	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
ac	.1183124	.1782327	0.66	0.507	-.2310172 .4676421
p	-.1330705	.2468624	-0.54	0.590	-.6169119 .3507708
qca	.1290638	.2392653	0.54	0.590	-.3398875 .5980151
educ	.5317586	.2778368	1.91	0.056	-.0127914 1.076309
age	.1642171	.1413968	1.16	0.245	-.1129156 .4413498
cons	-.924248	.5662472	-1.63	0.103	-2.034072 .1855761

Number of obs. = 111                      LR chi2 (5) = 6.33

Prob > chi2 = 0.2751 Log likelihood = -72.755858 Pseudo R2 = 0.0417

### 3.2 Factors Influencing Current Coffee Consumption (CCC) in China

To identify the factors that influence Current Coffee Consumption (CCC) behavior, it is estimated an ordered probit model with CCC behavior as dependent variable and with Coffee Preference (CP), Price (P), Quality Coffee Availability (QCA), Attitude towards Coffee and (AC) Coffee for Socialization (CS) along with other relevant factors as explanatory variables.

Table 4 illustrates the results of the ordered probit model. Coffee Preference, Attitude towards Coffee and Coffee for Socialization influence CCC behavior positively where as Price of coffee in the market and Quality Coffee Available in the market affect Current Coffee Consumption (CCC) negatively.

**Table 4 Results of Ordered probit Regression of Current Coffee Consumption (CCC)**

ccc	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
age	-.0754099	.1181839	-0.64	0.523	-.3070462	.1562264
educ	.0766465	.2042585	0.38	0.707	-.3236929	.4769859
cp	.2441215	.12383	1.97	0.049	.0014192	.4868238
ac	.0637677	.1479269	0.43	0.666	-.2261637	.353699
p	-.4553935	.2154985	-2.11	0.035	-.8777627	-.0330242
cs	.1536052	.1118026	1.37	0.169	-.0655238	.3727342
qca	-.2245117	.198293	-1.13	0.258	-.6131588	.1641354

Number of obs = 111 LR chi2(7) = 13.78

Prob > chi2 = 0.0552 Log likelihood = -149.48046

Pseudo R = 0.0441

Relatively, Current Coffee Consumption significantly affected by Coffee Preference (CP) and reasonable Price (P) existing in the market whereas the other independent variables such as Attitude towards Coffee, Coffee for Socialization and Quality Coffee Available in the market influence Current Coffee Consumption (CCC) insignificantly. Quality Coffee Availability in the market negatively associated with Current Coffee Consumption (CCC) in the analysis.

### 4 Finding

It is clearly recognized that the Chinese coffee market is growing rapidly and the fast growing westernized middle class Chinese, high number of returnees and ever growing number of expatriates are contributing for the boost of Chinese coffee consumption. There are several factors that can affect positively or negatively the current coffee consumption behavior of Chinese. Basically coffee preferences, price of coffee, quality coffee availability in Chinese market, attitude towards coffee are the main independent variables which can affect the current coffee consumption pattern in China. Why coffee preference among other hot drinks in China also studied in this article. There are independent variables which, has taken in to account such as price of coffee, quality coffee availability in Chinese market, attitude towards coffee, coffee for socialization, educational background and age. These independent variables have a positive and negative association with coffee preference

### 5 Conclusion

This research has proved Coffee demand in China is highly concentrated in large cities such as Beijing, Shanghai and Guangzhou. The target markets in these cities are categorized in three major groups Westernized young Chinese professionals, Ex-pats and Returnees. On the survey conducted on the above cities, one third of the sample population has showed a preference for coffee. The same survey has confirmed that three fourth of the population consume coffee irrespective of the price consideration and their age. From these we can conclude that the Chinese coffee consumption behavior cannot by the price of coffee but influenced by the availability premium quality coffee.

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## Analysis on Management Innovation of China Insurance Brokerage on MIT Mode

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**Abstract:** This paper analyzes the insurance brokerage management innovation of China in MIT model based on the rational transformation background and puts forward that the most important mission for China insurance brokerage industry is to satisfy the market growing multi-angle insurance brokerage demand with the advanced technology innovation development mode, to integrate industry chain by the technical service innovation and to forge core development power with China insurance brokerage group advantage. This paper elaborates the construction and practical experience of MIT model, we can get the conclusion that the core development power is different in different stage, and that we should integrate financial service supply chain by using new technology of insurance brokerage, take innovation management comprehensive service platform development as a orientation, promote service level by M&a and diversification and use innovation model to promote the insurance brokerage enterprise management revolution in China.

**Key words:** MIT mode; Collectivization integration; Management innovation; Core development power

### 1 Introduction

With the birth of China's first insurance broker company in June 2000, China insurance broker industry has developed from the scratch for over a decade, and we can see that the annual growth rate is over 30%. So China insurance broker industry has been called the most promising industry in the most promising business. Meanwhile, China insurance brokerage has inevitably experienced various problems and bottlenecks which have impede the industry into a more scientific and global growth in the past development process. As the theory of diversity in China insurance broker which should be combined with the reality is absent, so we must take measures to improve the study about China insurance broker.

In October 2007, Guangdong FanHua insurance brokerage came into market in NASDAQ. Its rapid development announced the end of the first developing generation in insurance brokerage with the core of relationship, information, technology and service. Subsequently, the second developing generation with the core of capital, mode, product and service comes onto the stage. Therefore, such issues for China insurance brokerage as what is the promising developing mode, what is a feasible and excellent developing mode, and how to build China insurance brokerage industry have been put in front.

The more and more obvious trend proves that the world of the future will be a world in which mobile application is the main contact platform. The insurance broker profession as the insurance intermediary part of the insurance broker development, the important way is relying on mobile business applications for employees and custom mobile Internet platform. In this platform, the staff can be effective in carrying out business, contact at any time and place to want to contact, and get strong backup network support.

In June 2012, CIRC (China Insurance Regulatory Commission) put forward an notice about the further insurance intermediary market access regulation. In his notice, all professional insurance intermediary organizations except the insurance intermediary services companies, auto production, sales and service enterprises, bank postal enterprises, insurance companies, insurance agents, brokerage companies and their branches, national insurance agents and brokerage company branches, which invest more than 50 million registered capital are forbid application for the establishment temporarily. The development history of insurance brokerage industry is so short and its foundation is so weak that China insurance brokerage institution specialized level is low and their risk control ability is weak. Many little, messy and low level institution must be transformed to be specialized, conforming to the insurance intermediary market development trend to effectively improve the professional level and the service ability of China insurance brokerage enterprises .

The 20 years practical experience of China's insurance market has proved that the mission of

insurance brokerage is to continuously satisfy the growing and multi-angle market demand of customers, adapt to the social economic development to the needs of the insurance broker and obtain international competition and multinational operation ability. Insurance brokerage enterprise must forge the core development power revolving around the needs of the customers to form the market competition and their own influence sustainable development force and establish the significant insurance market brokerage enterprise. Only with the internal sustainable development of the enterprise can get the market influence. Only with the market influence, can the enterprise obtain the core development power in the fierce market competition and get the sustainable development.

To better bridge the development cracks in role localization, CIRC put forward the Insurance Intermediary Services Company Supervision regulation in October 2011. This regulation makes the standard of insurance intermediary services group company market access, operating rules, supervision and management. The Insurance Intermediary Supervision Points Regulation in 2012 explicitly points out that we should encourage the insurance intermediary groups, improve the level of management and professional organization ability, and effectively improve the professional level agent market and comprehensive service ability. It is the best time for the improvement of China insurance brokerage in the near future.

## 2 Definition

Mobile Integrated Terminal is called MIT for short and it is an improving mode of mobile internet. The employees of insurance brokerage companies can do business by professional equipments such as laptops or Epos through the final customer service on internet. At the same time, they can learn about insurance brokerage solutions and products, docking electronic agent insurance policies, premium payment, insurance brokerage commission online payment and automatic transfer and other insurance brokerage services on the net. This mode effectively solve the problems of traditional insurance brokerage services sales mode, and it not only introduce the low carbon environmental protection, but also supply an efficient chain integration to promote the insurance brokerage enterprise management innovation.

Supply chain conformity is one of effective core elements of China insurance brokerage enterprise competitiveness. In modern time, it changes business scale so deeply, influence scope so broad and permeate links so deeply that it must be one of the subjects we need to study seriously. After the global financial storm in 2008, electronic supply chain promotes the acceleration of enterprises. Constructing an electronic business core services platform integrated of Production, supply and sales with insurance brokerage enterprise as the core will make different enterprises and different departments in one company coalesced deeply and reduce the chain transaction cost.

Collectivization can not only greatly strengthen the comprehensive competitiveness of the intermediary enterprise, improve management ability and market competition ability, but also improve the sustainability of the whole insurance intermediary industry. After more than ten years of development, the management idea, system mechanism and the personnel quality of China insurance intermediary industry has been improved greatly. Before the meeting hold by CIRC in March to support the construction of Min Taian insurance public evaluation Co., ltd., guangzhou MeiChen investment management consulting Co., Ltd., YingDa Changan insurance brokers Co., LTD and Beijing joint insurance brokers Co., LTD, there has been a number of insurance intermediary enterprises with considerable capital strength. It's no wonder that the collectivization of China insurance brokerage will be widely spread in the near future.

Core development power is the sustainable growth power based on the advantageous competitiveness. It is the collective wisdom integrated and accumulated by the whole business team and it will develop with the development of the whole business. It will Support the market competitive advantage of the enterprise in past, at present and in the future and it is the incorporation of the competitiveness and the development power.

The mission for China insurance broker is to realize the increasing multiple demands from the clients, and to acquire the capability to compete globally and operate multi-nationally. Only revolving the client's demand to develop the core power can the insurance broker company obtain the influence and sustainable development in this industry.

### **3 Composition**

#### **3.1 Distinctive corporate culture**

A distinctive corporate culture which is the source of business vitality is the precondition to develop the core power for an insurance broker company. Core development power comes from the management of the corporation, and the management is based on the corporate culture. The corporate culture in insurance broker industry consists of five elements: business environment, corporate value, heroic image, etiquette formality, and cultural network, amongst which the corporate value as the basic idea is the core. A successful insurance broker company puts forward clear corporate value as the common aim and regular norm for the staff. Meanwhile, such value is intensified by the heroic image, the legendary story as well as the etiquette formality.

The success of the corporate depends on whether the employees can identify accept and act as the values in this company or not. If the employees of the company can do as that, the corporate culture will be unique, and the corporate must be successful. The characteristics of the corporate culture in insurance brokerage filter into every business section. An excellent corporate culture not only encourages the employees' initiative and creativity but also makes up the shortage in business structure. Meanwhile, different corporate culture gives different service to its client, which determines the sustainability of the mutual business relationship.

#### **3.2 Distinctive service network**

Customers can complete all insurance purchase process through the 3G technology. At the same time, the new technology can offer product introduction, offer application, insurance contract instant completion, insurance premium transfer settlement, business management, all transactions in the validation and query. What's more, it can offer protection in the deal process, phone voice payment, WAP gateway payment and In APP products, which formed a complete mobile payment products matrix to fully meet the needs of businesses mobile payment. In the near future, there will be more remote and site pay and value-added application based on mobile interactive, mobile perception, mobile computing and mobile network, which play full use of the mobile business booster.

The enterprise should set up the fast and convenient insurance brokerage services system by the new technology like we elaborate above, and create unique brokerage market service system closely around the market demand and depending on the market. So the theme of the market competition is to win not the TOP but the ONLY. As we all know, the corporate can't be successful with basic competitive advantage. What is more, the TOP will be easily lost for the fast development and transmission of knowledge communication and employee turnover. The ONLY contributes to the exclusive service network which consists of expertise, human resource, public network and subsequent value-added service. The corporate should combine the TOP with the ONLY to make it unique, attractive and competitive. Only by this way can make the corporate get sustainable development, especially for the new insurance brokerage.

#### **3.3 Insurance brokerage environment innovation**

MIT model is opening a new insurance brokerage era, which offers a solution to solve the insurance buyers and sellers information block and bring great convenience during the process of insurance industry customers seeking, customization and personal services. Insurance brokers shorten the distance between the insurance company and clients, mobile intelligent terminal make insurance service and insurance consumption bundle together on Internet through MIT model. Especially, the development trend of the insurance company groups at present make the insurance company acquire a large number of customer data through the life insurance, insurance, health care, pensions, financial management, investment, Banks, credit card, rescue and so on. By using intelligent analysis system, whether they can offer new insurance products or not will be the key to the future individual insurance market competition. In mobile Internet age, production can't decide consumption, but consumption determines productions. In the past 200 years, the industrial revolution which we are familiar with may end. Humans will enter into the era of small-scale production. In this "small-scale production age", insurance customers no longer have no choices. In the key advantage products field, we must look for enterprise competitiveness. The figure 1 shows that China premium income of the constitution from the 2011, life insurance is the insurance brokerage business accounts for smaller field, and enterprise property insurance is the focus of insurance brokerage.

On the other hand, MIT model is a perfect choice as a kind of technical mean for the competition



obtaining. MIT model not only promoted insurance customer experience, but can also create a new insurance operation mode which can greatly reduce the operating costs and provide more favorable insurance service development space for the insurance brokerage in China. Research data shows that the Internet sales insurance costs are only 1/15 of the cost of insurance agent sales, cost of sales of the phone is 1/2. The service costs are only 1/42 of the agent service costs and it is 1/17 of the cost of services phone sales. Obviously, it is a win-win development in the path of the insurance business through the MIT model to promote insurance business development. This model reduces the cost and brings more profit to the enterprise. At the same time, it provides a more convenient channel, the more active insurance product selection and the more personal insurance service. First of all, we should strive to achieve insurance e-commerce "one-stop service target and extend the online insurance business sales from deal completion to the insurance checking, compensation checking and other

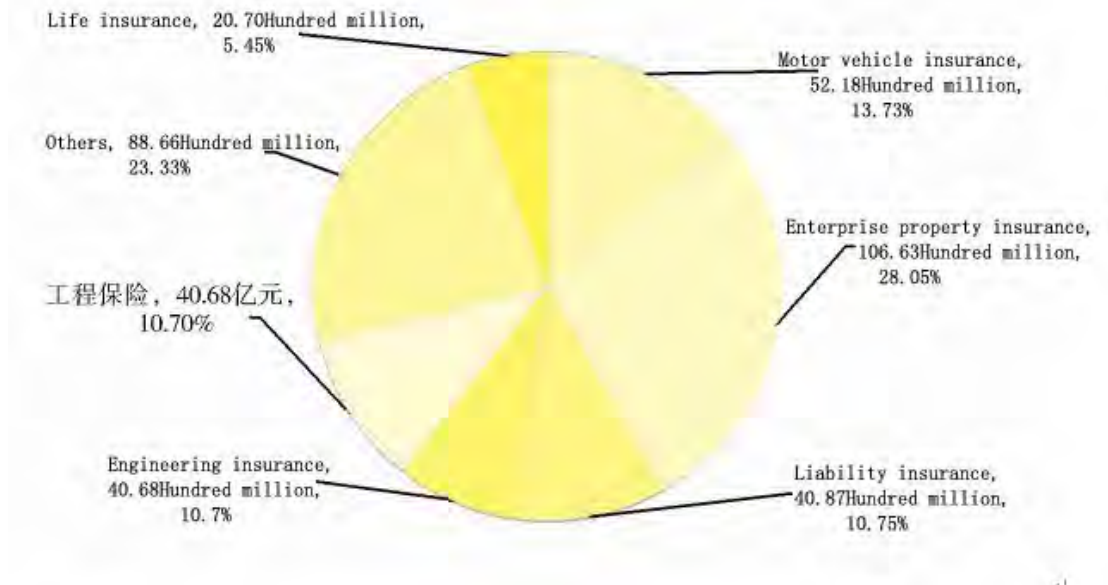


Figure 1 China Premium Income Constitution from the 2011

after-sales service process. Secondly, the electronic commerce environment of the insurance improve must be developed greatly. On the one hand, we must promote the construction and completion of the related electronic contract, both parties identity authentication, electronic payment, security and the construction and perfection of laws and regulations. On the other hand, we should support electronic commerce development of preferential policies, such as a related rate policy, to show the electronic commerce cost and price advantage and attract more customers. Then we must strengthen the construction of the electronic commerce insurance safety. Data encryption in E-commerce transactions which is to prevent hackers broke into and steal information or destruction of trading system, will be the focus of network security trading. Therefore, it's necessary to improve the network trade safety technical level and popularize the network security trade knowledge to promote the development of insurance for the network and provide a secure transaction platform to assure the safe and effective of the insurance e-commerce

Customers can enjoy the insurance portfolio which is designed by the insurance company based on the personal favor, which will do goods to the customer maintenance and promoting new business and expanding the market competitiveness.

At present, there are hundreds of millions of mobile e-business users in the world. The rapidly rising mobile equipment applications not only change the work mode, but also bring us a new way of life. According to ShangPu consulting data showed in January to march of 2012, global smart phone sales number is 146 million, an increase of 45%. Among them, the number in China accounts for about 22% of the world sales, which is more than 19% of the United States and become the world's largest smart phone market. Intelligent mobile phones, laptops, tablet computers and the growing popularity mobile devices, as well as the wireless network of broad coverage make the enterprises and customers in

real-time interaction between states anywhere. They can contract to cash flow from the integrity of the process, record telephone, response hotline, access to important information as long as instant access to their employees the handheld devices.

## **4 Methods**

### **4.1 Enhance the entrepreneur's consciousness for core development**

As the core and the leader of a business, the entrepreneur is supposed to obtain the core development consciousness which is essential in insurance brokerage industry. On the one hand, the entrepreneur with such consciousness is able to search the accurate market niche as well as to build the competitive operational mechanism. On the other hand, it is such entrepreneur that is able to make the decision and strategy before a full consideration on the core development.

### **4.2 Concentrate resources on the key sectors**

Such factors as advantages in the market and the product, and the scientific strategy help obtain short-term superiority. Only the combination of the core development and the long-term benefit can the insurance broker companies be established permanently. Therefore, the resources of insurance broker companies should be focused on building the distinctive corporate culture, create a unique service network, and develop human resource as well as on the sectors of risk management, virtual network and the VIP clients.

### **4.3 Create the comparative advantage in insurance broker market**

The comparative advantage, inspired by the competitor and the market, is to build the core development which is in turn supports this advantage. The advantage compared with the competitor is created after discovering its shortage. And the advantage from the market is created from market vacancy.

### **4.4 Build core development at varied stages**

At the beginning of a insurance broker company, it focuses on making a flexible and distinctive strategy to survive in the market. Further at the growing stage, the company has double points in core development which are firstly to acquire the core technology and secondly to improve the inner structure and management for a cohesive corporate culture.

## **5 Conclusion**

### **5.1 Open the insurance brokerage market**

Only with further insurance brokerage opening to the outside world and making full use of foreign capital advantage, learning from foreign advanced experience can we rapidly improve the overall operation of industry level and make the insurance brokerage market standardization, professional and international quickly. We should deeply open the insurance brokerage market and actively look for new development power and quickly seek for the best business model to improve the insurance sales function ability. We must pay more attention to the danger of exploration and research according to its own characteristics in the traditional and carry out actively service patterns of innovation, which will alter the existing income structure.

### **5.2 Merge and restructure the industry**

The mergence and restructuring of the potential insurance brokers realizes to establish the large scale broker company with combined industrial advantages as well as nationwide service network. Those small or medium sized companies of uneven and low qualification will be withdrawn from the market.

### **5.3 Go to public for capital**

Going to public in an allowed market environment breaks the capital bottleneck, improve comprehensive competitive power of these companies and make them more specialization and intensive developed. The corporate should make efforts to enhance their own degree of specialization and service level in order to adapt to the needs of the development of the insurance market.

In 2007, with the precedent combination of Fan Hua and Nas Dark in USA, the insurance brokers have confidence and desire to go public for adequate capital which is a fresh commercial model to integrate the resources in insurance industry. In modern time, many companies Take new business model to integrate the insurance industry resources, which will make insurance products of each big insurance company in the industry optimized combined. These products will meet the needs of users depending on the advanced technology and network platform with the most convenient and personalized services. It can be said that this will be the best solution to provide insurance service for the user in the future.

#### **5.4 Encourage industrial innovation**

The measures of establishing affiliates, virtual sale, and call sale help upgrade the insurance industry for a sustainable development. China insurance industry is promising and will develop quickly in the future. However, we are also faced with many troubles, and we should make more study about China insurance industry.

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# The Construction of Enterprise Culture in Hubei Province of China Based on Experiences of Haier

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**Abstract:** As the spiritual pillar of business survival and sustainable development, Enterprise culture is an important source of cohesion and creativity and the determining factor of the core competency of enterprises; therefore it is the common demands of enterprises and employees to build enterprise spiritual highlands and to strengthen the building of enterprise culture. Realistically in Hubei province, drawing on the experiences of successful cases (such as that of Haier) in building enterprise culture is of great significance for promoting the construction of enterprise culture in this province, building enterprise spiritual highlands, and enhancing the competitiveness of enterprise. Through the analysis of core effects of cultural factors on the success of Haier and the status quo and problems with the construction of enterprise culture in Hubei province, this paper put forward several proposals to strengthen the construction of enterprise culture in Hubei province of China, namely, to foster the unified core values among employees, to develop the people-oriented enterprise system, to build eclectic culture with its own characteristics, and to build a workforce with creativity and learning ability.

**Key Words:** Haier; Enterprise culture; Cultural innovation; Enterprises in Hubei province;

## 1 Introduction

Enterprise Culture is a new discipline stemming from the field of management sciences in the 1980s. Through 30- year rapid development, this discipline is gradually arousing the wide attention of academic circles and business world both domestically and abroad. It has become the spiritual power of enterprises to improve business performance, promote enterprise development and enhance the core competency. In the 21st century, with economic globalization and fierce competition in the market, the competition among enterprises will mainly focus on the core competency and learning ability which are based on enterprise cultures. The Sixth Plenary Session of the 17th CPC Central Committee clearly state that culture is the essence and soul of civilization, and that it is the inexhaustible spiritual support of and the source of power for national survival, development and prosperity. As an integral part of the socialism cultural system, enterprise culture will play a more prominent role in the development of people and society. Moreover, a large number of leading enterprises with prominent main business, strong core competency and obvious market competitive advantages will be needed to strongly support the leaping development of science in Hubei province, and to quicken the transition of Hubei province from 'Big' to 'Strong' in terms of industry and culture.

Excellent enterprise culture can unite the overall strength of enterprises, motivate employees to struggle for the common developmental goals and will ultimately enable enterprises to achieve sustainable success. The development of enterprise culture directly contributed to the successful rise of many world-class benchmark enterprises in China, such as Haier and Lenovo. Founded in 1984, a collective enterprise with only 800 staff at the beginning and an ever loss of RMB 1.47 million, Haier has developed into a leading enterprise globally in Home Appliance and has become a model of successful modern enterprises after 28 year development, during which the group witnessed such four developmental stage as brand creation, diversification, internationalization and globalization. Among others, the characteristic culture of Haier plays a leading role in its success. "Enterprise culture is the core competency of Haier", said Zhang Ruimin, CEO of Haier. Haier culture has been integrated into the operational management of the Group, guiding its development, standardizing its operation and enabling it to develop rapidly and vigorously in the competitive environment of economic globalization. Therefore, it is of great significance to draw on the successful experience of Haier to promote the building of enterprise culture and core competency.

## 2 Features of Haier's Enterprise Culture

As the sum of business philosophy, values, way of thinking and behavior recognized by the majority of employees and gradually developed in the long-term production, operation and management practice, enterprise culture is the main source of cohesion and core competency of enterprises. It is not

noticed in China both theoretically and in the business world until the 1980s, when enterprises in China began to develop from monopoly to completion. In 1984, with a loss of RMB 1.47 million, Haier first proposed the cultural concept of 'Culture First and Philosophy First', and this concept gradually develops into the current enterprise culture of Haier.

### **2.1 Innovation - the core of enterprise culture**

The core of Haier culture is innovation. Haier's enterprise culture is a staff-recognized staff value of innovation from business leaders. The survival and development of an enterprise depend on its own value, which is also its strategic point and the cornerstone against various temptations. In the course of 20 years development, Haier gradually formed a distinctive cultural system which takes conceptual innovation as guide, strategically innovation as direction, organizational innovation as guarantee, technological innovation as means and market innovation as goal. Haier culture itself is experiencing innovation with the development of the Group, and the essence of Haier's culture of innovation is to create the mechanism and platform producing first-class talents, based on which values are created for customers continuously and win-win culture is consequently developed, inputting powerful spiritual power for the enduring of the Group.

### **2.2 Core value - the soul of enterprise culture**

In the long-term business practice, Haier has established its core value: customer-oriented, development-focused, and interest-driven.

Customer-oriented - Think what consumers think. This means that customers are always right, while Haier itself is always wrong, and this is the momentum for itself to create users. Haier thinks that customers are always right and therefore tries all means to meet their needs and even create needs for them. On the other hand, Haier believes that it is always wrong, and this attitude can help to continuously challenge itself and make breakthrough - deal with change with change, and seek for success in the process of change. Both attitudes form the intrinsic genetic characteristic of the sustainable development of Haier - not changing with the change of the world, and developing with the development of times. This gene, with the two creative spirit of Haier people (entrepreneurship and innovation), forms its core features maintaining its competitive advantage in the ever-changing market.

Development-focused-Entrepreneurial spirit and creativity. Haier requires that each employee should possess both entrepreneurship to transfer him/herself from "managed and motivated" to "self-managed and self-motivated" and spirit of innovation to create new values, which result from the creation of new customer resources. These two creative spirits are the unchanging genes of Haier culture, which not only guide the personal development of employees, but also restrict the employees' values.

Interest-driven - win-win Culture. Haier is about all stakeholders - our employees, customers and shareholders. Only the win-win culture can guarantee the sustainable growth of Haier. In order to realize this goal, Haier will continue to innovate its business modes to build a Haier-specific win-win culture-the enterprising and innovative employees will be committed to value creation for customers in different independent operations, while at the same time realize values for themselves, the company and shareholders. In independent operations, each employee enters into a contract with the customer, shifting from "managed and motivated" to "self-managed and self-motivated". This is what we call "human-oriented management". The win-win culture at Haier provides resource and system support for every employee to be enterprising and innovative, which ensures spontaneous innovation in the ever-changing world.

### **2.3 Full participation - the characteristics of enterprise culture**

The most significant feature of Haier culture is employees' identification and their active participation. Haier has encouraged its employees to show their things around them in the form of cartoon by themselves since 1998. The employees' full participation and their identification form an unique "employees' pictures and words" culture of Haier, which fully arouses the enthusiasm of all staff, deepen their understanding of corporate culture, but also promotes their active participation.

Corporate culture must be the culture of maximizing the value of all staff. Haier's current goal is to create a brand-name in the world, and win the glory for the nation, which perfectly combine the development of Haier and the value pursuit of its employees. Every staff will fully realize his or her value and pursuit during the process of becoming the brand-name in the world. Turn the social man into the masters of the enterprise, turn the intellectuals into the experts of enterprise management, and turn the migrant workers into the industrial workers, realize the maximization of enterprise value and the value of all employees.

### **2.4 Mechanism - the guarantee of enterprise culture**

The formation of Haier culture is system engineering, also an important reflection of Haier's Core competency. This ideological form, explicit in style and features of the factory and implicit in the heart of the employees, is implemented into the various branches and each department's operation and management, and reflected through Haier's business strategy and all the standards and systems of Haier characteristics.

Haier's law is also called slope ball theory. It thinks that the enterprise is a ball located on the slopes. If the ball is slightly relaxed, it will slide down. Therefore, companies need a stop power, which is the management. The management of the enterprise is a long-term work, which needs to be persisted, rather than some unexpected activities. In order to reinforce the basic management, Haier created Haier model, namely, the OEC management, which is composed by the target system, the control system and an effective incentive mechanism. The Target system refines the target to every person per day, and clear their responsibilities and objectives. The control system, strictly requires the daily workload to be completed, and demands that every day's performance should be improved. An effective incentive mechanism includes "three co-exist, the dynamic conversion", "points wages", "total points wages" etc. The target system is to set goals, the control system is to manage various basic work to achieve the goals, and an incentive mechanism is to ensure that the full efforts toward this direction. OEC management has attracted wide attention, because it can well control their work to be completed according to targets, which thus solve the problem of current enterprise's hard management after its development.

### **3 The current situation and problems of the construction of Enterprise Culture in Hubei**

The enterprise culture is always associated with a certain stage of the development of enterprises, especially the more mature phases in the development of enterprises. The development of enterprise culture of Hubei is closely related to the development of the enterprises themselves in Hubei. Along with the continuously development and growing of the enterprises in Hubei, the overall construction of the enterprise culture in Hubei is also showing a process of development from spontaneous to conscious.

#### **3.1 The understanding of the construction of enterprise culture is gradually deepened.**

The construction of enterprise culture in Hubei started in the 1980s. With the continuous deepening of the reform of the economic system and the strong promotion of the Marketization process, the understanding of the construction of enterprise culture is gradually deepened.

First, change the understanding tendency, which thinks the construction of enterprise culture, is superfluous and insignificant. In the development process, enterprises in Hubei gradually realize the importance of cultural construction and no longer pursue the superficial, slogan, and moving of cultural activities, but combine enterprise culture construction with the modern enterprise management closely, and so implement enterprise culture practically.

Second, change the understanding tendency in the past that the construction of enterprise culture is the matter of the leader, and it has nothing to do with the general staff. Enterprise culture can make employees combine the embodiment of their own values with business goals. The construction of Enterprise culture requires not only the correct leadership of the highest leader, also depends on the participation of the entire staff.

Third, change the understanding tendency in the past that the construction of enterprise culture is the cultural accumulation, rather than the active construction. An excellent enterprise culture does not happen overnight or by accident, usually requires a longer period of accumulation and then gradually reveals. However, the culture of the spontaneous formation by employees, often vary from the enterprise's development strategy, long-term planning and the design of the system. If we ignore it, it is bound to affect the ultimate realization of the corporate goals.

#### **3.2 The characteristics of the construction of enterprise culture are gradually vivid.**

In general, the fundamental values of the enterprise culture must reflect some of the ethical spirit. The enterprises in Hubei change the past practices, which only focus on the dominant role of "people-oriented", "integrity" and "innovation" etc, as the basic values, thus ignore the combination of common practice and their own personality traits. They especially attach importance to give the construction of enterprise culture a new connotation and content, combine the individual characteristics with the business practice, and carry out the construction of enterprise culture creatively, finally form an enterprise culture full of special feature.

There are 24 enterprises which are short-listed the outstanding units of the national enterprise culture construction in 2011. WISCO, Dongfeng Motor, Daye Nonferrous, Yangtze Optical Fiber, Group

of Bai buting, Blue Special Group and other enterprises, form the enterprise culture with distinctive characteristics, such as "Asia Plus" of Dongfeng Motor Corporation, "Four Day" culture of WISCO, "Cultural Localization" in Hubei Yihua, "Fiberhome Cultural" of Wuhan Institute of Posts and Telecommunications, "Human Oriented Culture in Project" of China Railway 11th Bureau, "Daohuaxiang Culture" of Hubei Daohuaxiang group by long-term exploration and construction, which embody the people's minds, and promote the development of enterprises.

### **3.3 The measures of the construction of enterprise culture is gradually improved**

The construction of enterprise culture requires long-term accumulation, practice, advocacy, nurture and shape. After years of exploration and practice, Hubei enterprises continuously build and perfect the system of corporate culture. In this process, Hubei enterprises stick to this concept-"educating staff, managing enterprise, promoting the enterprise by culture", continuously improve the quality of enterprise culture construction, actively explore new paths of cultural construction and management for enterprise development, and make efforts to achieve the transformation of enterprise management from management to culture, from promoting by single enterprise to advancing by enterprise , party and government, society as a whole, and form the matching of form and content, form a good pattern of the construction of enterprise culture, which is the resonance of leader advocating and staff involving, the combination of enterprise culture-"soft" and institutionalized management-"stiffness" ,internal and external coordination, spirit and substance into account.

### **3.4 The role of the construction of enterprise culture is increasingly prominent.**

In the era of global economic integration, the power of culture has been an important driving force for the development of enterprise. Enterprise culture is the "engine" which promotes the rapid development of enterprise. The construction of enterprise culture unite the wisdom and strength of the staff to the fullest extent, make the formation of values-oriented and institutional constraints, harmonize the labor relations, and give full play to workers' initiative. It also promotes the enterprise and workers to build a community of interests, provide an inexhaustible source of the power to the scientific development of enterprise, and enhance the Core competency of the enterprise. Dongfeng, WISCO, Yihua, Wuhan Tobacco, Daye Nonferrous, Third Ring Road, Huaxin, The Flames of Communications, entered China's top 500 manufacturing enterprises in 2010, and Dongfeng, WISCO entered the World's top 500 in 2010. At present, there are 51 Chinese famous products, 63 Chinese well-known trademarks, 655 famous brand products in Hubei province. The manufacturing competitiveness index of Hubei is 82.43, ranking the first in the central.

Although the construction of enterprise culture in Hubei has achieved some success, there are still some problems, such as the unbalance development of enterprise culture construction, less understanding of it, insufficient attention to it, and the weakness of the material foundation, etc. We should further strengthen the guidance, change concepts, research strategies, and implement the plan.

## **4. The implication of Haier culture on the construction of enterprise culture in Hubei**

Haier's success shows that enterprise culture plays an important role in the existence and sustainable development enterprises. Compared with Haier, enterprises in Hubei far lag behind in this respect, and therefore the successful experience of Haier provides a useful inspiration for further promoting the construction of enterprise culture in Hubei.

### **4.1 Refining the unified core value of employees**

Unified value requires that employees should possess the same value orientation in their ideology, which should also be displayed in their words and deeds. Such quality as dedication and the pursuit of excellence (Haier Spirit), customer-oriented attitude, the concept of quality that the defective is the waste and so on are all the impetus for customer creation in Haier. Haier culture is very unique, and its content involves many aspects of enterprises. It is an ideology which infiltrates enterprise, and especially some of the central part of Haier culture are explored and created by the enterprise and is widely recognized and learned. Therefore, the construction of enterprise culture in Hubei should pay particular attention to refining, explaining and guiding the core values of enterprise culture, making employees intuitively understand and accept it both in mind and in deeds.

### **4.2 Establishing people-oriented enterprise system**

Integrating institutional culture into enterprise culture is conducive to the formation of staff awareness and behavior. Haier's OEC management model (O - Overall, E - Everyone, Everything, Everyday and C - Control, Clear), the conception that everyone is talented and skillful, and the full

market chain concept that everyone is a market and that everyone has a market and so on all deeply expound the people-oriented ideas and systems from different angles. Therefore, the cultural construction of enterprises in Hubei should adhere to the combination of popular culture of staff and enterprise culture, the combination of personal development and enterprise vision, and the combination of institution building and cultural construction. Enterprises should follow the principle of self-management and self-improvement among employees, foster the shared values of employees and enterprises, coordinate the relationship between diversified personal values and unified enterprise value, and enhance the level of institutionalization and standardization in the construction of enterprise culture.

#### **4.3 Building the eclectic characteristic culture**

An excellent enterprise culture must integrate the essence of national culture and the historical humanistic spirit, and should absorb the nutrition of traditional culture and world culture to enrich and develop itself. Zhang Chaoyang, the CEO of Haier Group, integrates ideas of traditional culture from "The Analects of Confucius", "The Art of War" and "Moral" into the construction of enterprise culture. On the basis of inheriting Chinese traditional patriotic spirit, he actively absorbs the spirit of innovation and teamwork from American and Japanese enterprises, and proposes the enterprise culture with rich traditional cultural atmosphere. The enterprise culture of Haier is gradually enriched and developed in its developmental process to adapt to the needs of the enterprise development. Therefore, the construction of enterprise culture, should not only be based on traditional culture, but also actively absorb the world's outstanding culture. By integrating the essence of both of them, enterprises can develop its unique eclectic culture.

#### **4.4 Cultivating the workforce with innovation and learning ability**

Continuous innovation is the fundamental way for enterprises to develop themselves, and is also the most effective way to improve the competitiveness of enterprises and to maintain a competitive advantage. Haier's innovations, such as the creation of the win-win culture are the learning results of Haier people, and they fully show that the spirit of entrepreneurship and innovation is the unchanging gene of the Haier culture. Therefore, Hubei enterprises should continuously improve the quality of staff, create a strong atmosphere of learning and innovation, and foster new work-based learning and learning-based working concept, creating a learning-oriented enterprise to improve innovative capacity.

### **5 Conclusion**

The building of enterprise culture is a long-term process and a system engineering project. Excellent enterprise culture is an important guarantee to keep the enterprise energetic. Therefore, it is the important issue of theoretical and practical research to actively explore the law of the enterprise culture construction and establish the cultural system with distinct time characteristics that meets the needs of the times, meet the modern enterprise needs, meet the specific needs of enterprises. The successful experience of the excellent enterprises will undoubtedly provide a positive inspiration to promote the building of enterprise culture in Hubei province.

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# Analysis on Financial Strength of the Listed Companies in Hubei Province of China

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**Abstract:** Using the method of principal component analysis to analyze the 74 listing Corporations' financial situation in Hubei province. We select 7 financial indicators, using SPSS software to extract 4 main components with principal component analysis method, and we get composite scores of the listing Corporations. The comprehensive analysis of listing Corporations' financial strength in Hubei Province of China provides some evidence for the listing Corporation to improve management, investment decision and Hubei college students' employment.

**Key words:** Financial strength; the principal component analysis; Comprehensive Evaluation Index System; Hubei province

## 1 Introduction

With capital market development, economic entity, which has become the leading force of Chinese market-oriented economy, is represented by the listed companies. From national economy's point of view, the success of its development highly depends on the overall strength of listed companies. From investor's point of view, financial status of listed companies are different, it is difficult for creditors and investors to choose the lending or investing target. Therefore, how to analyze the financial status of listed companies and the comprehensive evaluation has become the focus of the national security administrative organization. The formal financial status evaluation method is traditional ratio analysis. This method's determination of weighing and application of quantization grading is heavily relying on the author's subjective judgment. Besides, numerous interconnected indicators cannot be differentiated. Therefore, the evaluation result cannot objectively reflect financial status of listed companies.

At present, the principal component analysis method and factor analysis method are widely used, and they have achieved remarkable results in economics, sociology, biology, medicine and other fields. By using principal component analysis (PCA), this article eliminates interaction of evaluating indicators when deals with multi-dimensions and interrelated variable space, as well as determines weight according to the degree of variation of each index value. It also avoids priorities due to personal deviation. By evaluating status of stock circulation of 74 listed companies in Hubei province, the article provides scientific and practical evaluation method to those related decision makers.

## 2 Construct Comprehensive Evaluation Index System

### 2.1 Principle of constructed index system

1) Objectivity principle: When constructs index system, it must in accordance with reality, and on the basis of disclosure information which has audited and verified by certificated public accountant or the related regulator.

2) Overall principle: When constructs index system, the content must thorough reflect every element which influenced financial status of listed companies. Each indicator must be coordinated. Dynamic indicator must act in concert with static indicator; comprehensive indicator must act in concert with individual indicator.

3) Practical principle: When constructs index system, it must be practical that possibility, reliability and economical efficiency of obtaining all indicators' data must be considered.

### 2.2 Design comprehensive evaluation index system

Based on above principles, this article chooses 7 indicators which are rate of Main Business Profit Margins (A1), Inventory Turnover Ratio (A2), Asset Liability Ratio (A3), Equity Ratio (A4), Receivable Turnover Ratio (A5), Cash Ratio (A6), and Quick Ratio (A7).

Construct comprehensive evaluation index system of financial statuses of listed companies. 1) Factor of fund allocation: it mainly indicates stocks' quantity that the listed companies owned, as well as working capital ratio, etc. Generally speaking, earning capacity of a company is

proportional to its capital holding and circulating fund. 2) Earning capacity index, which reflects the listed companies' profit and capacity. Greater earning capacity means better financial status. The index includes Main Business Profit Margins and Inventory Turnover Ratio. 3) Fixed Asset Index, which shows listed companies' market value and equipment valuation etc. 4) Operating capacity index, which tells managers' management usage efficiency and expansion capacity about assets. It embodies assets operating capacity. Higher management capacity means better financial status. It includes Receivable Turnover Ratio, etc.

### 3 Construct the Principal Component Analysis

On the basis of competitive strength evaluation index system of software companies, the article applies the principal component analysis, and constructs comprehensive evaluation model of competitive strength of software companies. Here is the following steps:

Suppose there are m listed companies and has n evaluation index of competitive strength, which form the following matrix:

$$X_{n \times m} = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ x_{n1} & x_{n2} & \cdots & x_{nm} \end{pmatrix} \tag{1}$$

#### Step 1: Pretreatment of Primary Data

Each indicator determined by the evaluation has different dimension and order of magnitude, which means neither can compare together, nor use multivariate statistical analysis. Therefore, standardizing index value is essential so as to eliminate the differences of dimension and order of magnitude, which makes it comparable. Two steps are taken for data transform processing: centralizing the data and standardizing standard deviation.

##### 1) Centralization

Changed the primary data as:

$$z_{ji} = x_{ji} - \bar{x}_j \quad (j = 1, 2, \dots, n; i = 1, 2, \dots, m) \tag{2}$$

Among all,  $\bar{x}_j = \frac{1}{m} \sum_{i=1}^m x_{ji}$ , is mean value of index in each row. As the result of transform, it comes

to the new matrix:  $Z_{m \times n} = [z_{ji}]_{nm}$ .

##### 2) Standardization

Changed the data in Matrix  $Z_{m \times n} = [z_{ji}]_{nm}$  as:

$$z_{ji}^* = z_{ji} / s_j \tag{3}$$

Among all,  $s_j = \sqrt{\frac{1}{m} \sum_{i=1}^m (x_{ji} - \bar{x}_j)^2 / m - 1}$ , is unbiased variance of indicator in each row. After

centralization and standardization, it comes to the new matrix:  $Z^*_{m \times n} = [z^*_{ji}]_{nm}$ .

#### Step 2: Find Out Correlation Matrix among Indicators

According to the new matrix,  $Z^*_{m \times n} = [z^*_{ji}]_{nm}$ , compute sample correlation coefficient matrix  $R = [r_{kl}]_{nm}$ . Among all,  $r_{kl}$  is the correlation coefficient of indicator k and indicator l.

$$r_{kl} = \frac{1}{n} \sum_{j=1}^n z^*_{jk} z^*_{jl} \quad k, l = 1, 2, \dots, m \tag{4}$$

#### Step 3: The Principal Component Analysis

1) According to sample correlation coefficient matrix R, find out its Eigen value  $\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_n \geq 0$ , and corresponding unit Eigen value characteristic vector is  $(e_1 \ e_2 \ \dots \ e_n)^T$ ;

2) The P<sup>th</sup> principle component of the j<sup>th</sup> column is  $y_{pj} = e_p \cdot z_j^*$  (p=1,2,...,m),  $e_p$  is the p<sup>th</sup> Eigen value's corresponding Eigen value characteristic vector, and  $z_j^*$  is the column vector of n indicator in column j;

3) The p<sup>th</sup> principle component's contribution rate is  $a_p = \frac{\lambda_p}{\sum_{i=1}^n \lambda_i}$ , the cumulative contribution rate

of the first k principle components is  $\sum_{i=1}^k a_i$ .

**Step 4: Comprehensive Order of the Principle Components**

The cumulative contribution rate of the adopted first k principle components is normally more than 80%. This can not only cover the major information of n variables, but also reduce to k, which can achieve simplification of multi-indicators' comprehensive evaluation.  $a_p$  is weight, find out weight.

Sum of  $y_{pj}$ , it can get integrated value  $y_j$  of the j<sup>th</sup> column:

$$y_j = \sum_{p=1}^k a_p y_{pj} \tag{5}$$

Among all:  $a_p$  is the contribution rate of the p<sup>th</sup> principle component,  $y_{pj}$  is the p<sup>th</sup> principle component of column j.

**4 Application of the Principle Component Analysis**

**4.1 Source and pretreatment of sample data**

In this paper, it studies 72 listed companies' financial data in Hubei province, which are selected from Tong Huashun software in 2011. Geographically, Hubei lies in the center of China, which runs north and south, with large population. Analyzing financial status of listed companies and competitive industries in Hubei is highly related to China's development.

**4.2 Apply spss to the principle component analysis**

1) Standardized transformation of data.

In order to eliminate incomparability of dimension, use formula(2)、(3) to standardize pretreatment data.

**Table 1 Relationship between Eigen value of related matrix and cumulative contribution rate**

Component	Explained Total Variance								
	Initial Eigen values			Extract Square and load			Spin Square and load		
	Total	Variance %	Cumulation %	Total	Variance %	Cumulation %	Total	Variance %	Cumulation %
A1	2.823	40.328	40.328	2.823	40.328	40.328	2.029	28.983	28.983
A2	1.412	20.169	60.497	1.412	20.169	60.497	2.014	28.778	57.761
A3	1.246	17.795	78.292	1.246	17.795	78.292	1.399	19.983	77.744
A4	.988	14.115	92.407	.988	14.115	92.407	1.026	14.663	92.407
A5	.526	7.514	99.921						
A6	.006	.079	100.000			.000			
A7	-2.065E-17	-2.951E-16	100.000						

2) Correlation matrix derived from standardized matrix.

Since 7 indicators derived from standardized matrix has strong correlation, which makes information that reflected by each table overlapping. This means that using the principle component analysis has advantage in objectively dealing with multidimensional correlated indicators.

3) Table 1 shows relationship between Eigen value of related matrix and cumulative contribution rate.

From table one, the first four components' cumulative contribution rate is 92.407%>85%. Therefore, using overall evaluation to analyze the first four components out of 74 listed companies can not only simplified analyzing structure, but also can assure accuracy. By using SAS6-12, it can output the first four eigenvector's normalized Eigen value characteristic value, which is shown on table 2.

4) Economic Implication of the principal component

Eigenvector in table 2 shows that Asset Liability Ratio, Equity Ratio, Cash Ratio and Quick Ratio of the first principle component are not only positive, but also large. Though Inventory Turnover Ratio is positive, it is almost zero. Therefore, the first principle component illustrates capital allocation of listed companies, which here, it is called asset allocation factor. Main Business Profit Margins, Inventory Turnover Ratio of the second principle ratio is not only positive, but also large. Hence, the second principle component mainly shows the earning capacity of listed companies, it is called efficiency factor. Inventory Turnover Ratio of the third principle component is high, so it is called fixed asset factor. Only Receivable Turnover Ratio of the fourth principle component is positive and large, so, it tells operation capacity of listed companies. It is called operating factor.

**Table 2 Component Matrix**

Component Matrix				
	Component			
	1	2	3	4
Zscore(A1)	.383	.701	.284	-.012
Zscore(A2)	.076	.747	.297	-.383
Zscore(A3)	-.827	-.154	.529	-.088
Zscore(A4)	.827	.154	-.529	.088
Zscore(A5)	-.056	.266	.271	.907
Zscore(A6)	.804	-.346	.477	-.036
Zscore(A7)	.807	-.355	.465	-.039

Method :The Principle Component Analysis  
a. picked up 4 components

5) Overall Score derived from formula (5), listed from high to low in Hubei Province in Table (3).

Among 74 listed companies in Huberi Province, Wuhan Guide Infrared Co., Ltd, Yuan Hua Real Estate Co., Ltd, and Hubei Chu Tian Expressway Co. are the top 3 companies in comprehensive evaluation of financial status, which means they are powerful in all. Wuhan National Pharmaceutical Technology Co. Ltd , Chang Jiang Shipping Group Phoenix Co., Ltd, and Guodian Changyuan Electric Power Co., Ltd are last, the next to last and antepenultimate, which means week in earning capacity, debut paying capacity and operating capacity. Though listed in ST portfolio, Hubei Wuchangyu Co., Ltd has better debt paying ability, so it ranks in the middle of evaluation. Because of lacking data, it fails to find out the overall score of Wuhan Double Co., Ltd and Changjiang Securities Company Limited. What is more, Hubei J.S Corrugating Machinery, Hubei Yihua Chemical Industry Co., Ltd and Wuhan East Lake High Technology Group Co., Ltd were listed on the market in 2009, which were raised a large amount of circulated fund, which influenced the result to some extent. Therefore, considering the influence of anomaly, these three companies should be ranked behind.

**Table 3 Overall Score of Listed Companies' Financial Strength**

Name	Overall Score	Name	Overall Score	Name	Overall Score
Wuhan Guide Infrared Co., Ltd	2.2839	Wuhan Kaidi Electric Powe Co. LTD	-0.0381	SDIC Power Holdings Co., Ltd.	-0.2661
Yuan Hua Real Estate Co., Ltd	1.8702	Routon Electronic Co., Ltd	-0.0437	Hubei Bothwin Investment Co., Ltd.	-0.2699
Hubei Chu Tian Expressway Co., Ltd	1.5765	Angel Yeast Co., Ltd	-0.0448	Wuhan East Lake High Technology Group Co., Ltd	-0.2739
Wuhan Zhongyuan Huadian Science and Technology Co., Ltd	1.4918	Wuhan Yangtze Communications Industry Group Co., Ltd	-0.0496	Hubei Guochuang Hi-tech Material Co., Ltd	-0.2808
Hubei Tech Semiconductors Co., LTD.	0.8326	Wuhan Tianyu Information Industry Co., Ltd	-0.05	Hubei Energy Group Co., Ltd	-0.2832
Qianjiang Yongan Pharmaceutical Co., LTD	0.8083	Huagong Tech Company Limited	-0.0691	Zhongbai Holdings Group Co., Ltd	-0.2873
Hubei HuiTian Adhesive Enterprise Co., Ltd	0.5879	Join-in (Holding) Co., Ltd	-0.0738	Wuhan Xianglong Power Industry Co., Ltd	-0.2948
Wuhan Fingu Electronic Technology Co., Ltd	0.5564	Hubei Wuchangyu Co., Ltd	-0.0803	China Gezhouba Group Co., Ltd	-0.2972
Rongfeng Holding Group Co., Ltd	0.5156	Hubei Guangji Pharmaceutical Co., Ltd	-0.0835	Eastern Gold Jade Co., Ltd	-0.2994
Hubei Dinglong Chemical Co., Ltd	0.4442	Hubei Aviation Precision Machinery Technology Co., Ltd	-0.1002	Xiangyang Automobile Bearing Share Co., Ltd	-0.3059
Wuhan P&S Information Technology Co., Ltd	0.299	Wuhan Jianmin Pharmaceutical Groups Co., Ltd	-0.1177	Wuhan Department Store Group Co., Ltd	-0.3067
Wuhan Langold Real Estate Co., Ltd	0.2461	Wuhan Hanshang Group Co., Ltd	-0.1422	Wuhan Iron and Steel Company Limited	-0.3161
MaYinglong Pharmaceutical Group Co., Ltd	0.2158	North Electro-optic Co., Ltd	-0.1435	Hubei Xingfa Chemicals Group Co., Ltd	-0.3219
Wuhan Golden Laser Co., Ltd	0.1865	Wuhan Zhongnan Commercial Group Co., Ltd	-0.1568	Jiontown Pharmaceutical Group Co., Ltd	-0.3297
Wuhan Huazhong Numerical Control Co., Ltd	0.1569	Fiberhome Telecommunication Technologies Co., Ltd	-0.1621	Dongfeng Automobile Co., Ltd	-0.3595
Sound Environmental Resources Co., Ltd	0.1344	Huxin Cement Co., Ltd	-0.1662	Wuhan Linuo Solar Energy Group Co., Ltd	-0.4641
Wuhan Sante Cableways Goup Co., Ltd	0.1236	Hubei Sanonda Co., Ltd	-0.1858	Hubei Mailyard Share Co., Ltd	-0.471
Accelink Technology Co., Ltd	0.0432	Zhong Zhu Holding Co., Ltd	-0.1941	Hubei Maiya Co., Ltd	-0.5122
Hubei J.S Corrugating Machinery	0.0175	Hubei Biocause Pharmaceutical Co., Ltd.	-0.1954	Wuhan Sanzhen Industry Holding Co., Ltd	-0.516
Kingdream Public Co., Ltd	0.0131	Wuhan Plastics Industrial Group Co., Ltd	-0.2023	Guodian Changyuan Electric Power Co., Ltd	-0.5839
Hubei Hongcheng General Machinery Co., Ltd	0.0081	Daye Special Steel Co., Ltd	-0.2089	Chang Jiang Shipping Group Phoenix Co., Ltd	-0.7049
Kaile Science and Technology	-0.0061	Hubei Golden Ring Co., Ltd	-0.2111	Wuhan National Pharmaceutical Technology Co., Ltd	-1.1043
Wuhan Humanwell Healthcare (Group) Co. Ltd	-0.0095	Hubei Sanxia New Building Materials Co., Ltd.	-0.245	Wuhan Double Co., Ltd	
China Aerospace Electric Technology Co. Ltd.	-0.0291	Hubei Shuanghuan Science and Technology Stock Co., Ltd	-0.2536	Changjiang Securities Company Limited	
Hubei Fuxing Science and Technology Co. Ltd	-0.0359	Hubei Yihua Chemical Industry Co., Ltd	-0.264		

## 5 Conclusion

In general, we use the principle component analysis to extract 4 main components from the whole 7 financial indicators, and we get composite scores of the 74 listing Corporations. The comprehensive analysis of listing Corporations' financial strength comparatively and objectively reflects the financial status and overall strength of these 74 listed companies in Hubei Province.

On the one hand, this article provides some directive significance to investors and creditors' decision making; On the other hand, each listed company can find out their strength and weakness by this objective evaluation, which can achieve better development; Moreover, there are numbers of listed companies and colleges and universities in Hubei Province, graduates have doubts when they are hunting for a job. Job hunter can choose a suitable listed company by using this overall ranking and financial index of these listed companies.

In future research, we can combine the method with cluster analysis or other methods to achieve better effect and it can also be extension used in the research of real estate, new energy, automotive and other industries.

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# An Empirical Research on the FDI in Services and the Economic Growth in China

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**Abstract:** Today it's globalizing world, and China has already become one of the countries who absorb the most FDI, especially the FDI in service industry(SFDI) has become one of the most important factor affecting China's economic development. This paper employs an econometric model to explore the relationship between SFDI and GDP per capita, and reports the differences of the FDI of main service industries on economic growth. At last, it gives comments and suggestions for the development of various FDI on the basis of results.

**Key Words:** FDI; High-end service; Economic growth; Regression equation

## 1 Introduction

With the development of economic globalization and the adjustment of world economics structure, the service industry as an important part of the industrial structure has gradually become a main engine of national economic development. After China has been entered into WTO, the improving status of Foreign Direct Investment has brought a lot of employment opportunities and economic profit for our country, to promote the growing of China's economic strength. Especially, foreign direct investment in service industry (SFDI) played an important role. According to statistics, foreign direct investment accounted for 1.78% of the gross domestic product (GDP) in 2010, compared to a decline in 2009; SFDI accounted for 47.25% in total foreign investment, compared to an increase in 2009; besides, the SFDI proportion of GDP was higher than in 2009. From here we can see that, SFDI has been in a growth trend, as a whole, and its contribution to China's economic is gradually enhanced. This paper builds some models to state the differences of the FDI of several major High-end Service in China high-end service industry on the impact of China's economic growth.

## 2 Relevant literature review

The theory research of SFDI abroad focuses on two aspects, one is to lead the research of manufacturing FDI theory into SFDI, the other is to explain SFDI by international trade theory<sup>[1]</sup>.

Although the related research in our country is not much, some also confirmed the important role of the production of services to China's economic growth, and it can promote China's economic development through technological progress and innovation, deepening the division of labor, increasing production efficiency, industrial clusters, improving the region's investment environment as well as the interaction with industry and other services. For example, the research of some people or organizations such as Borensztein, Arrken, Langnan Chen, and Wei Zuolei showed that the FDI of production services has a significant role in the host country's economic growth. Huang Weiping also analyzed from a quantitative point of view, confirmed that, whether in the short or long term, the FDI of production services and GDP have strong correlation and it has a remarkable enhancing effect on GDP growth<sup>[6]</sup>.

Early empirical researches mostly focused on the study of the correlation between FDI and economic growth, then researchers started to pay attention to their causal relations. Some empirical researches based on the new growth theory do deep analysis on the mechanism of FDI on economic growth. There are two basic conclusions of the study, first is that there's a positive correlation between FDI and economic growth, but the existence of causal relations and direction are not consistent; the second is that there are various impacts of FDI on economic growth, and its effects is relevant to the absorptive capacity of the host country.

Zhang Yun<sup>[1]</sup>, who chose Shanghai as the object of study, found than the effects of the level of industrialization and urbanization and the service labor market on the FDI of Shanghai's modern service is not significant, while the opening and market structure play a greater role in the process of attracting the FDI of Shanghai's modern service. Yang Jing<sup>[7]</sup> did a regression analysis about the FDI of our service industry and the GDP of some related services, found that the FDI of our service industry have greatest driving effect on the economic growth of China's real estate, and smallest on the transport storage and post and telecommunications industry. Wu Tao's study found that the driving effect of service industry to the GDP is

obvious, and the effects of technological research and technical service are the greatest<sup>[8]</sup>. Concerning the mechanism of action that SFDI do to China's economic growth, Zhuang Lijuan believed the technical effect, trade effects and employment effects play the most significant role in promoting our economic growth, and The role of size in order is employment effects, technical effects and trade effects<sup>[9]</sup>.

In summary, we found that most studies have shown that the FDI or SFDI play an active and positive role in promoting economic growth in the past at home and abroad, and it has spillover effects to the host country to bring the knowledge, technology and other intangible assets. However, most studies at home and abroad were about the services in whole or production services, and little about high-end services that have many effects on our economic development. Therefore, this article aims to examine the specific impact of each industry on economic growth from the perspective of the FDI of some major high-end services.

### 3 Empirical Analysis

#### 3.1 Data sources

At present, most scholars generally agree that high-end services have "high five" characteristics, high intellectual, high-income (benefits), high-fashion and high efficient, accounting for 70% of the service industry, and they are the engine of China's economic development. This article learns from abroad related to the classification of high-end services, and takes into account the contribution of some services to China's economic growth and the possible impact on the political, social and cultural, therefore, we divide high-end services into the following seven kinds: "Transport, storage and postal industry"; "Financial industry"; "Education"; "Information transmission, computer services and software industry"; "Scientific research, technical services and geological prospecting industry"; "Business services"; "Real estate industry". In the data selected aspects, concerning its accessibility, long-term and stability, we choose five from seven to do analysis, they are "Transport, storage and postal industry"(abbreviated to JT and called "Transport" later), "Financial industry"(abbreviated to JR), "Education"(abbreviated to JY), "Scientific research, technical services and geological prospecting industry"(abbreviated to KX and called "Science" later), "Real estate industry"(abbreviated to FC). All data used for analysis are from the China Statistical Yearbook, and the sample interval is from 1999 to 2010. In order to remove the effect of changes in the price level, these indicators are adjusted to 1978 price levels. We use EVIEWS to do regression analysis on the FDI of high-end services and economic growth, taking per capita GDP (abbreviated to MGDP) as explained variable and the FDI in various sectors as explanatory variables, and then explore the differences exist. In addition, in order to eliminate possible heteroscedasticity, this paper changes variables into natural logarithm when in use.

#### 3.2 Effect analysis of SFDI and China's economic growth

Regression analysis can help us understand the dependencies between a variable with another variable, knowing the closely relationship between economic growth and services, we first build up a regression equation between the whole FDI of high-end services (abbreviated to AFDI) and MDP, and analyze the dependence relationship between the two, the regression result is as follows:

$$\begin{aligned} \ln(MGDP) = & -2.887672073 + 0.434657164 * \ln(AFDI) + 0.2412365637 * \ln(AFDI(-1)) \\ & (-1.958042) \quad (2.60186) \quad (1.04414) \\ & + 0.02875478373 * \ln(AFDI(-2)) \quad (1) \\ & (0.17455) \\ R^2 = & 0.874672 \quad F = 13.95808 \quad D.W. = 0.726731 \end{aligned}$$

Because in the result  $t = 2.60186$  is larger than  $t_{(0.025)}(8) = 2.306$  under the significant level of 5%, we can see that the overall FDI of high-end services was significantly associated with GDP per capita in 1999 to 2010, but in the latter, their association is not very obvious and AFDI has little impact on economic growth. The value  $R^2 = 0.874672$  shows that 87.47% of the changes in per capita GDP can be explained by the changes of high-end services above. Through the coefficient ahead of AFDI, we can see that, Every increase AFDI \$10000, per capita GDP will increase by \$0.435 when AFDI for each additional \$10,000. DW value look-up table shows there is no self-related phenomenon.

#### 3.3 Effect analysis of the FDI of some related services and China's economic growth

In general, economic indicators will be influenced by environment, technology, politics, and so on. Therefore, we should consider all aspects of the economic indicators to assess the overall effectiveness, but also explore the future development direction when finding differences. In this paper, we established



distributed lag models to analyze the FDI of several major high-end services and economic growth, respectively, so that we get a thorough understanding of the relationship between the current and late FDI and economic growth. The regression equations are as follows:

Transport:

$$\begin{aligned} \ln(MGDP) = & -3.658087651 + 0.3552265296 * \ln(JT) + 0.4915799118 * \ln(JT(-1)) + \\ & (-0.885896) \quad (0.87419) \quad (1.07423) \\ & 0.07958355359 * \ln(JT(-2)) \quad (2) \\ & (0.25850) \end{aligned}$$

$$R^2 = 0.498554 \quad F = 1.988464 \quad D.W. = 0.768240$$

Financial industry:

$$\begin{aligned} \ln(MGDP) = & 2.413952948 + 0.1573145661 * \ln(JR) + 0.06194668046 * \ln(JR(-1)) + \\ & (3.372681) \quad (1.93746) \quad (0.60978) \\ & 0.1613888289 * \ln(JR(-2)) \quad (3) \\ & (1.75803) \end{aligned}$$

$$R^2 = 0.745236 \quad F = 5.850409 \quad D.W. = 0.780947$$

Education:

$$\begin{aligned} \ln(MGDP) = & 7.474112955 - 0.1390907203 * \ln(JY) - 0.01406573119 * \ln(JY(-1)) - \\ & (25.41439) \quad (-2.55006) \quad (-0.18143) \\ & 0.2002885626 * \ln(JY(-2)) \quad (4) \\ & (-3.00168) \end{aligned}$$

$$R^2 = 0.911580 \quad F = 20.61944 \quad DW = 2.213948$$

Science:

$$\begin{aligned} \ln(MGDP) = & 2.429307467 + 0.3453150082 * \ln(KX) - 0.1142841048 * \ln(KX(-1)) + \\ & (18.79589) \quad (6.97695) \quad (-2.50633) \\ & 0.1126763004 * \ln(KX(-2)) \quad (5) \\ & (4.36397) \end{aligned}$$

$$R^2 = 0.990290 \quad F = 203.9652 \quad D.W. = 2.126339$$

Real estate industry:

$$\begin{aligned} \ln(MGDP) = & -1.962315149 + 0.3921450215 * \ln(FC) + 0.1778530235 * \ln(FC(-1)) + \\ & (-1.096864) \quad (2.25323) \quad (0.74088) \\ & 0.06901184793 * \ln(FC(-2)) \quad (6) \\ & (0.37212) \end{aligned}$$

$$R^2 = 0.785360 \quad F = 7.317910 \quad D.W. = 0.615241$$

Because of the  $t_{(0.025)}(8) = 2.306$  under the significant level of 5%, we can see from the results that there are only "Education" and "Science" which are significantly associated with MGDP; because of the  $t_{(0.05)}(8) = 1.860$  under the significant level of 10%, four service industries above except "Transport" are significantly associated with MGDP, and their relevance ranking of the current period is above:

Science > Education > Real estate industry > Financial industry

Something should be noted that among these industries which have significant correlation with MGDP, "Science" has one and two lag effect, it has a strong stimulating effect on China's future economic development.

Contrasting the value  $R^2$  in each equation, we find that 99.03% of the changes in per capita GDP can be explained by the changes of "Science", and the value  $R^2$  of "Education" is also more than 90%, it shows science education has an important influence on China's economic growth.

It is remarkable that, the coefficients of the FDI of education industry are negative, and it indicates there is significant negative correlation with economic growth in China. The likely reason is that when we are developing education vigorously, more investment and income are still focused on domestic, but

less use of foreign investment. What's more, the advantages of other country's education are not fully applied in China's education system. Contrast the coefficients of "Science", "Real estate industry" and "Financial industry", sector FDI impact factor, despite the impact of the FDI of "Scientific" on economic changes is bigger, the actual contribution of the FDI of "Real estate industry" is highest, and per capita GDP increased by \$ 0.392 when average increase of \$ 10,000.

#### 4 Conclusion

In this paper, through the regression analysis of the FDI of high-end services and in China's economic growth between 1999 and 2010 FDI, we find that the former have an important impact on the latter, the following conclusions are:

First, the current FDI of high-end services has a significant positive correlation to China's economy, and it can promote economic development, but lacks of late effects. So, China should increase foreign direct investment inflows to high-end services, take adequate and reasonable use of the technology spillover effects of foreign direct investment, thereby enhancing the competitiveness and the overall level of China's high-end services, and increase high-end services industry's role in promoting China's economic growth.

Second, although the transportation, storage and postal services industry takes a large proportion in the foreign direct investment, it has no significant effect of economic growth. On the contrary, the FDI of emerging science and education have a greater impact. It shows that China should correctly understand the correlation between various industries and economic growth, effectively implementing the strategy of rejuvenating the country through science and education to strengthen the use of foreign direct investment. In education, we should change current related negative into a positive correlation; In science, we should pay close attention to its late effect on economic growth, and give full play to its impact on other industries in China's economic structure.

Third, through the analysis of the regression equation, we should see their actual contribution while understand the degrees of influence of the FDI of various industries on the economic changes. In this sphere, the actual contribution of "Real estate industry" is highest, and "Science" is second, "Financial industry" is followed. Therefore, China should increase the FDI in the rectification process of the real estate industry.

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## Analysis on Status and Characteristics of China's Wheat Flour Processing Industrial Structure\*

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**Abstract:** At present, the industrial structure of China's wheat flour processing has changed greatly. These structural changes make China's wheat flour processing industry present some new characteristics. Identifying these characteristics will help to optimize the industrial structure of China's wheat flour processing, which will accelerate the sustained and healthy development of wheat flour processing industry. This paper analyzes the status of China's wheat flour processing industrial structure using ratio analysis method based on statistical data. The characteristics of China's wheat flour processing industrial structure are also studied by means of comparative method based on statistical data. The results reveal that the industrial structure of China's wheat flour processing was optimized and presented new characteristics in 2010.

**Key words:** Wheat flour processing industrial structure; Status; Characteristics; Ratio analysis method; Comparative method

### 1 Introduction

Grain industry covers grain production, acquisition, storage, processing, sales and other links, which constitute an industrial chain involving agriculture, industry and trade. Grain processing is divided into 8 categories, which are rice processing industry, wheat flour processing industry, edible vegetable oil processing industry, corn processing industry, grain food processing industry, coarse cereals and potatoes processing industry, feed processing industry and grain machine equipment manufacturing industry. Grain processing industrial structure is in constant change with the development of China's economy. Adjusting and optimizing grain processing industrial structure will lead to a good and rapid development of the grain processing industry. Therefore, studying the status and new characteristics of China's grain processing industrial structure will have an important practical significance to the optimization of wheat flour processing industrial structure.

Existing Chinese literatures only considered the annual production capacity (referred to as capacity for short) and output of wheat flour processing in the status research of China's grain processing industrial structure and only explained the annual production capacity and output of wheat flour processing with the then rough statistical data.<sup>[1]</sup> Some Chinese experts only explored some characteristics of China's grain processing industry; and research about the characteristics of the wheat flour processing industrial structure is rare.

### 2 Status of China's Wheat Flour Processing Industrial Structure

#### 2.1 Regional distribution of China's wheat

Wheat is the most important crop in the world. The population living on wheat as their staple food is more than 35 % around the world.<sup>[2]</sup> Wheat is the staple food of the majority of Chinese people. Wheat grains contain rich starch, lots of protein, a small amount of fat, and a variety of mineral elements and vitamins B.<sup>[3]</sup>

In China, there are 10 eco-wheat growing regions: northern winter wheat region, Huang-Huai winter wheat region, winter wheat region along the middle and lower reaches of Yangtze River, winter wheat region along the upper reaches of Yangtze River, southern winter wheat region, Qinghai-Tibet spring and winter wheat region, northeast spring wheat region, northern spring wheat region, northwestern spring wheat region and Xinjiang winter and spring wheat region.<sup>[2]</sup> The output of hard winter white wheat in Henan Province, Shandong Province and Hebei province accounts for about 60 % of the national output. There are three high-quality dedicated wheat industrial belts in China, which are Huang-Huai-Hai Plain, Middle and Lower Yangtze Plain and Great Khingan foot.<sup>[1]</sup>

#### 2.2 Characteristic of wheat flour processing regions in China

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The annual production capacity of China's wheat flour processing industry ranks the first in the world. In recent years, the major wheat cultivation regions have carried out industrialized operation with a close chain by taking advantages of their abundant wheat resources, enhanced their brand awareness, improved their product competitiveness and market share, and continued to study and adopt new technologies and new process, thus further improving their product output and quality; and also they have conducted management innovation and system innovation within the enterprises, constantly improved the modern enterprise system, promoted integration and combination, optimized the industrial structure, and emphasized the development of wheat flour processing industry, thus it has a number of wheat flour processing industrial belts took shape nationwide, among which are the high quality dedicated wheat processing industrial belts in Hebei and Henan Province.

The annual production capacity and output of China's wheat flour processing industry is centralized in the major wheat producing regions in Huang-Huai-Hai Plain, and the output of Henan, Shandong and Anhui provinces accounts for 59.4% of the total output.\*

Henan Province is a strong player in China's wheat flour processing industry. All its main indicators of wheat flour processing industry rank the first in the country. According to statistics, in 2010, there were 720 wheat flour processing enterprises in Henan Province, accounting for 23.8% of the total number of wheat flour processing enterprises in China; the annual production capacity of its wheat flour processing was 46.99 million tons, accounting for 29.4% of the total annual production capacity of wheat flour processing in China; while the wheat flour output was 22.98 million tons, accounting for 30.5 % of the total wheat flour output in China; in addition, Henan Province acquired 62 patents in the wheat flour processing industry, accounting for 24.2% of the total patent number in wheat flour processing industry in China. These data suggest that, Henan Province is at present China's largest wheat flour processing industrial belt, which plays a significant role in China's grain security.

### 2.3 Number structure of China's wheat flour processing enterprises

China's wheat flour processing enterprises can be simply divided into five types according to their daily wheat flour processing capacity (tons/day): enterprises with capacity of less than 30 tons, enterprises with capacity of 30-100 tons (including 30), enterprises with capacity of 100-400 tons (including 100), enterprises with capacity of 400-1000 tons (including 400), and enterprises with capacity of more than 1000 tons (including 1000). The number structure of wheat flour processing enterprises by daily wheat flour processing capacity reflects the number distribution situation of enterprises of all kinds of daily wheat flour processing capacity, which reveals the concentration ratio of wheat flour processing industry. Statistical data shows that, at the end of 2010, there were 3025 wheat flour processing enterprises in China, in which, enterprises with capacity of less than 30 tons account for 8.6% of the total number, enterprises with capacity of 30-100 tons account for 28.0% of the total number, enterprises with capacity of 100 - 400 tons account for 49.3% of the total number, enterprises with capacity of 400-1000 tons account for 11.4% of the total number, enterprises with capacity of more than 1000 tons account for 2.7% of the total number, and enterprises with capacity of more than 400 tons account for 14.1% of the total number(see Figure 1).<sup>1</sup>

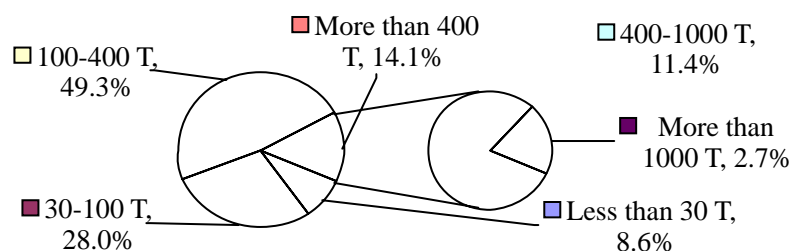


Figure 1 Number Structure of China's Wheat Flour Processing Enterprises

Figure 1 shows that, at present, wheat flour processing enterprises with capacity of less than 30 tons were few, enterprises with capacity of more than 1000 tons are the least in number, and about 1/2 enterprises fall into the scope of enterprises with capacity of 100-400 tons, which suggests that most wheat flour processing enterprises are medium-sized, better than the entire grain processing industry

\* Wu Zidan. Statistical Data of Grain and Oil Processing Industry in 2011. 2011:13-81(In Chinese)

dominated by SMEs, that the concentration rate of wheat flour processing industry is relatively high, however, still a big gap from that of the United States, France and other Western developed countries.

#### 2.4 Annual production capacity structure of China's wheat flour processing industry by daily wheat processing capacity

China's wheat flour processing industry can be simply divided into five types based on the daily wheat processing capacity (tons/day): daily capacity of less than 30 tons, daily capacity of 30-100 tons(including 30),daily capacity of 100-400 tons (including 100), daily capacity of 400-1000 tons (including 400), and daily capacity of more than 1000 tons (including 1000). Annual production capacity of wheat flour processing industry refers to that calculated on the basis of the designed daily wheat processing capacity and 24hours a day with three shifts. Enterprises' production capacity refers to the maximum quantity of products of certain types and certain quality that can be produced, or the maximum quantity of processing certain raw materials that can be processed during a certain period of time with all fixed assets for production of the enterprise under a certain organizational technical condition. Annual production capacity of wheat flour processing enterprise reflects the scale of the enterprise. Annual production capacity structure of wheat flour processing industry by daily wheat processing capacity reflects the annual production capacity distribution situation of enterprises of various types of daily wheat processing capacity and reveals the scale degree of the wheat flour processing enterprises. The statistical data shows: in 2010, the annual production capacity of China's wheat flour processing industry was 159.54 million tons, in which, annual production capacity below 30 tons accounted for 0.7% of the national total capacity; annual production capacity of 30-100 tons accounted for 7.3% of the national total capacity; annual production capacity of 100-400 tons accounted for 44.9% of the national total capacity; annual production capacity of 400-1000 tons accounted for 29.1% of the national total capacity and annual production capacity above 1000 tons accounted for 18.1% of the national total capacity(see Figure 2).<sup>1</sup>

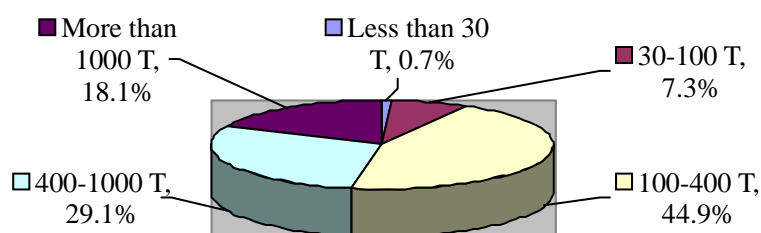


Figure 2 Annual Production Capacity Structure of China's Wheat Flour Processing Industry by Daily Wheat Processing Capacity

Figure 2 can be seen that, at present, annual production capacity of China's wheat flour processing industry below 30 tons takes an extremely minor percentage; annual production capacity of over 1000 tons takes a relatively greater percentage; annual production capacity of 100-400 tons takes a significant percentage; while annual production capacity of 100-1000 tons accounts for 74 %; annual production capacity of China's wheat flour processing industry by daily wheat processing capacity is dominated by 100-1000 tons, and the scale degree of wheat flour processing industry is relatively high.

#### 2.5 Annual production capacity structure of China's wheat flour processing industry by enterprise economic types

China's wheat flour processing industry can be simply divided into state-owned and state controlled enterprises, foreign, Hong Kong, Macao and Taiwan invested enterprises and private enterprises by enterprise economic types. Annual production capacity structure of China's wheat flour processing industry by enterprise economic types reflects the wheat flour production capacity distribution of enterprises of different economic types and reveals the possible roles of wheat flour processing enterprises of various economic types. The statistical data shows that, in 2010, China's wheat flour capacity was 159.54 million tons, in which, wheat flour capacity of state-owned and state controlled enterprises was 14.39 million tons, accounting for 9% of the total capacity; wheat flour capacity of foreign, Hong Kong and Macao and Taiwan invested enterprises was 6.99 million tons, accounting for 4.4% of the total capacity; and wheat flour capacity of private enterprises was 138.14 million tons, accounting for 86.6% of the total capacity.<sup>1</sup> It can be seen that private enterprises play a leading role in the production capacity of China's wheat flour processing industry.

## 2.6 Output structure of China's wheat flour processing industry by varieties

Wheat flour processing industry varieties are divided into seven types: patent flour, clear flour, straight flour, whole meal, tailored flour, strengthened nutritious flour and others.<sup>[4]</sup> Output structure of wheat flour processing industry by varieties reflects the output distribution situation of various grades of wheat flour and can reveal the propensity to consume and its distribution in the case of a balance between supply and marketing. The statistical data shows that, in 2010, China's wheat flour output was 75.29 million tons, in which, 33.52 million tons were patent flour, accounting for 44.5% of the total output; 20.35 million tons were clear flour, accounting for 27.0% of the total output; 12.25 million tons were straight flour, accounting for 16.3% of the total output; 750,000 tons were whole meal, accounting for 1.0% of the total output; 5.81 million tons were tailored flour, accounting for 7.7% of the total output; 320,000 tons were strengthened nutritious flour, accounting for 0.5% of the total output; and 2.29 million tons were others, accounting for 3.0% of the total output (see Figure 3).<sup>1</sup>

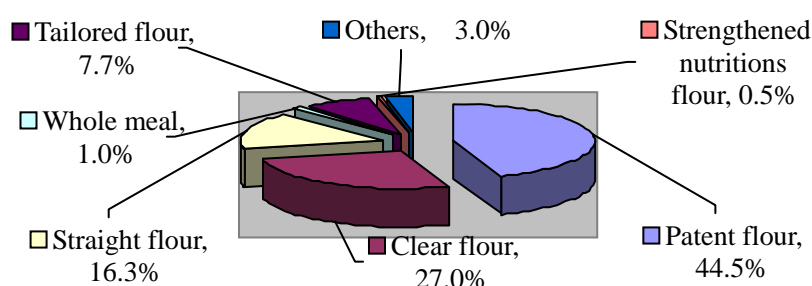


Figure 3 Output Structure of China's Wheat Flour Processing Industry by Varieties

Figure 3 can be seen that, presently, the main products of China's wheat flour are patent flour and clear flour, the total output of which accounts for 71.5 % of the total output, and this also reflects the improvement of living standards of the people of China.

## 2.7 Output structure of China's wheat flour processing by enterprise economic types

As mentioned earlier, China's wheat flour processing industry can be divided into state-owned and state controlled enterprises, foreign, Hong Kong, Macao and Taiwan invested enterprises and private enterprises by enterprise economic types. Output structure of wheat flour processing industry by enterprise economic types reflects the wheat flour output distribution situation of enterprises of different types and reveals the role and position of wheat flour processing enterprises of different economic types. The statistical data shows that, in 2010, China's wheat flour output was 75.29 million tons, among which, the wheat flour output of state-owned and state controlled enterprises was 5.65 million tons, accounting for 7.5% of the total output; wheat flour output of foreign, Hong Kong, Macao and Taiwan invested enterprises was 3.78 million tons, accounting for 5.0% of the total output; and wheat flour output of private enterprises was 65.86 million tons, accounting for 87.5% of the total output.<sup>1</sup> It can be seen that, private enterprises are at present the main body of absorbing and arranging labor force and employment which decides the trend of wheat flour processing industry and holds a dominant position in China's wheat flour processing industry.

## 3 New Characteristics Analysis of China's Wheat Flour Industrial Structure

Analyzed in accordance with relevant statistical data and survey data, the new characteristics of China's wheat flour industrial structure in 2010 are as follows.

### 3.1 Further improvement of the overall strength of wheat flour processing industry

The policies of maintaining price and stabilizing supply, directed marketing and auction taken by China have ensured the sufficient grain resources of wheat flour processing enterprises and controlled the price growth of wheat flour. Statistical data shows that, in 2010, there were 3025 wheat flour processing enterprises in China, increased by 239 with a growth of 9% compared with the previous year; the annual production capacity of wheat flour processing industry was 159.54 million tons, increased by 37.86 million tons with a growth of 31% compared with the previous year; wheat flour output was 75.29 million tons, increased by about 20 million tons with a growth of 36% compared with the previous year; the total industrial output value of wheat flour processing enterprises was 225.1 billion Yuan with a growth of 42.5 % compared with the previous year; the industrial added value was 24.2 billion Yuan

with a growth of 54.2 % compared with the previous year; the total profit was 4.1 billion Yuan with a growth of 57.4% compared with the previous year; while the profit margin of sales revenue was 1.9% with a growth of 0.2 percentage points compared with the previous year.<sup>1</sup>The capability to withstand market risks of China's wheat flour processing enterprises was improved and the economic benefit was also increased slightly.

### 3.2 Further optimization of product variety structure of wheat flour processing industry

Among the wheat flour varieties, patent flour, clear flour, straight flour and tailored flour are in the dominant position. As mentioned earlier, in 2010, patent flour output accounted for 44.5% of the total wheat flour output in China, clear flour output accounted for 27% of the total output, straight flour output accounted for 16.3% of the total output, and tailored flour output accounted for 7.7% of the total output, while the output of these four products together accounted for 95.5 % of the total output, thus these four products were in a dominant position. In terms of the wheat flour output structure by varieties, clear flour, straight flour and whole meal were increased in their output compared with the previous year, patent flour and nutritionally strengthened flour remained basically the same with the previous year; while tailored flour and others were decreased in output compared with the previous year. The output of all wheat flour varieties had increased compared with the previous year, and as shown by the statistical data, in 2010, the output of whole meal increased by 46.6% compared with the previous year, ranking the first; straight flour increased by 46.4 % compared with the previous year, ranking the second; nutritionally strengthened flour increased by 46.3% compared with the previous year, ranking the third; while tailored flour increased by 5.3% compared with the previous year, ranking the last(see Table 1). The product variety structure of wheat flour processing industry was further optimized, showing a good trend.

**Table 1 Output Structure of China's Wheat Flour Processing Industry by Varieties**

Item	2009		2010				
	Output (10000 T)	Structure( %)	Output (10000 T)	Structure( %)	Output increase (10000 T)	Growth rate (%)	Structure change (%)
Patent flour	2465	44.6	3351.7	44.5	886.7	36.0	0.0
Clear flour	1422.4	25.7	2035.4	27.0	613	43.1	1.3
Straight flour	837	15.1	1225.5	16.3	388.5	46.4	1.1
Whole meal	50.9	0.9	74.6	1.0	23.7	46.6	0.1
Tailored flour	551.5	10.0	580.8	7.7	29.3	5.3	-2.3
Strengthened nutritious flour	21.6	0.4	31.6	0.4	10	46.3	0.0
Others	184.3	3.3	228.9	3.0	44.6	24.2	-0.3
Total	5532.7	100	7528.5	100	1995.8	36.1	

### 3.3 Consolidation of private enterprises' dominant position

In terms of capacity, output, total industrial output value, product sales revenue, profits, etc. of wheat flour processing industry, China's private enterprises enjoy an advantage over other grain processing industry (except the edible vegetable oil industry). As mentioned earlier, in 2010, the wheat flour capacity of China's private enterprises was 138.14 million tons, accounting for 86.6% of the total capacity with a growth of 31% in capacity and 0.1 percentage point in capacity structure compared with the previous year; while the wheat flour output of private enterprises was 65.86 million tons, accounting for 87.5 % of the total output with a growth of 38 % in output and 0.9 percentage point in output structure compared with the previous year. It can be seen that the dominant position of private enterprises in wheat flour processing industry has been consolidated continuously and private enterprises have become the main force of China's wheat flour processing industry.

As mentioned earlier, in 2010, the wheat flour capacity of foreign, Hong Kong, Macao and Taiwan invested enterprises in China was 6.99 million tons, accounting for 4.4% of the total capacity with a growth of 32.4 % compared with the previous year, which was 1 percentage point higher than the average capacity growth of wheat flour processing industry, thus presenting a relatively rapid capacity growth; while the wheat flour output of state-owned and state controlled enterprises in China was 5.65 million tons, accounting for 7.5% of the total output with a growth of 43 % compared with the previous

year, which is 6.8 percentage points higher than the average output growth of wheat flour processing industry, presenting a rapid output growth.

### **3.4 New heights of scale operation of wheat flour processing industry**

China has integrated some small and medium-sized enterprises in the wheat flour processing industry; after the integration, enterprises of backward capacity are eliminated, while the number of large and medium-sized enterprises increases and the scale operation gets further development. As mentioned earlier, in 2010, the number of enterprises with daily wheat processing capacity of 100-400 tons was 1490, increased by 256 with a growth of 20.7% compared with the previous year; the number of enterprises with daily wheat processing capacity of more than 400 tons was 427, increased by 165 with a growth of 63% compared with the previous year; while the product output of enterprises with daily wheat processing capacity of more than 400 tons was 42.445 million tons, accounting for 56.4% of the total output with a growth of 4.2 percentage points compared with the previous year. It can be seen that the scale operation of China's wheat flour industry has obtained new results and has laid the foundation for the enhancement of scale economies.

### **3.5 Gradual increase of capacity utilization rate of wheat flour processing industry**

The capacity utilization rate of wheat flour processing industry is the ratio between the annual raw materials processing quantity and the annual raw materials processing capacity,<sup>[5]</sup> which reflects the capacity utilization degree of wheat flour processing industry. It is internationally recognized that it shall be taken as overcapacity if the capacity utilization rate is below 75%.<sup>[1]</sup> At present, the capacity of China's wheat flour industry is still in a state of overcapacity as a whole. Statistical data shows that, the capacity utilization of China's wheat flour processing industry is 70.3% in 2010, with a growth of 3.1 percentage points compared with the previous year.<sup>1</sup> This shows that the capacity utilization rate of wheat flour processing industry is gradually increasing and the phenomenon of equipment being in idle and equipment waste is reducing.

## **4 Conclusions**

According to above the status and characteristic studies of China's wheat flour processing industrial structure using ratio analysis method and comparative method, the paper made the following conclusions:

We found that the industrial structure of China's wheat flour processing had been further optimized in 2010, such as number structure of China's wheat flour processing enterprises, annual production capacity structure by daily wheat processing capacity, output structure by varieties, etc.

The industrial structure of China's wheat flour processing presented new characteristics in 2010, such as the further optimization of product variety structure, the consolidation of the leading role of private enterprises, new breakthrough of large-scale operation, the gradual increase of capacity utilization rate, and so on.

The industrial structure of China's wheat flour processing is in constant change and need to be timely adjusted and optimized to promote a sustained and healthy development of wheat flour processing industry.

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# The Influence of Investment in Fixed Assets on GDP in Liaoning Province of China

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**Abstract:** With economic development, Liaoning Province of China investment in fixed assets is increasing, which is a growing role in boosting the GDP. Investment in fixed assets can be divided into a lot of kinds by economic types, we collected data from 1995 to 2010 in Liaoning Province, and used econometric method to study the influence of three major investment in fixed assets on GDP, the three major investment in fixed assets are state-owned fixed assets investment, the collective economy fixed assets investment and individual economy fixed assets investment, which account for a larger proportion in the amount of investment in fixed assets. We want to illustrate the importance of investment in fixed assets in Liaoning Province to the province's economic development.

**Key words:** GDP; State-owned fixed assets investment; Collective economy fixed assets investment; Individual economy fixed assets investment; Econometric method

## 1 Introduction

In 2008, the international financial crisis struck, China's economy suffered a huge impact. China decided to invest 400 billion yuan to expand domestic demand, and fixed assets investment accounted for a large proportion in the 400 billion yuan investment. Today, China introduced measures to expand domestic demand have effectively prevented the economic downturn, ensured the growth rate, but also provided the impetus to world economic recovery. In this context, to study the fixed assets investment in boosting the economy is very significant.

Academia has researched the impact of investment in fixed assets on economy for a long time, De Long and Summers in 1992 proved that there was significant positive correlation between fixed assets investment and economic growth in some countries such as America, the higher the rate of investment in fixed assets, the faster the rate of economic growth<sup>[1]</sup>. However, there are some results show that between investment growth and economic growth independent of each other, there is no causal relationship (Lutz, 1999; Harris and Vally, 2000). Domestic scholars on the study of investment in fixed assets, Liu Jinquan et al. (2002) find that exist simple two-way causal relationship in the level between investment in fixed assets and actual GDP (non-Granger causality), but there is no correlation between the rate of change. Mao Jingyi (2006) thinks that the influence of the fixed assets investment fluctuations on economic fluctuations is significant, which plays a positive role in fixed asset investment growth boosts output growth, and influence model is dynamic, fixed assets investment fluctuations before economic fluctuation two months<sup>[2]</sup>.

In previous studies, there are more literatures about the influence of national investment in fixed assets on GDP, while the sub-region, detailed classification of fixed asset investment, quantitative analysis of the impact of a particular investment in fixed assets in the region on its GDP in few papers. Especially in recent years, the researches about the impact of Liaoning Province of China investment in fixed assets on its GDP are less. But I think the investment in fixed assets is the main driving force for national economic development, but also an important indicator to measure a national and regional production capacity. The allocation proportion of investment in fixed assets in the different forms impacts on the future ownership structure, investment diversification is the first mentioned conditions to adjust and improve the ownership structure. Since the 1990s, the growth of investment in fixed assets in Liaoning Province is rapid and stable. From 1995 to 2010, total fixed asset investment increased to 1.604303 trillion yuan from 86.55 billion yuan, which is the main driving force to promote the Liaoning sustained and rapid economic growth.

Therefore, based on the background of the economic growth mode transformation, through statistical analysis to study Liaoning Province investment in fixed assets since the 1990s, is of great practical significant for the province to promote economic development.

## 2 The Selection of Variables

In this article, I mainly analyzed the impact of investment in fixed assets in Liaoning Province of

China on the province's economic situation. I used the GDP indicators to reflect the economic performance of Liaoning Province. I mainly collected state-owned economy, collective economy and individual economy the three accounted for a larger proportion of the investment project data for the empirical analysis.

GDP, namely gross domestic product, refers to in a period of time (a quarter or a year), the value of all final goods and services produced in a country or region's economy, is often recognized as the best indicator to measure a country's economic situation. So in this paper, I selected Liaoning province's GDP to measure the economic conditions of Liaoning province.

Investment in fixed assets can be divided into the investment in fixed assets of state-owned economy, collective economy, individual economy, joint ownership, share holding economic, foreign funded, Hong Kong, Macao and Taiwan investment economy by economic types. Among them, state-owned economy, collective economy and individual economy of these three types of investment and GDP remained the same rising trend since the 1990s, and account for a large proportion of the total investment in fixed assets, it can be said that the three types investments largely affect economic growth, so in this article, I selected the state-owned economy, collective economy and individual economy, the three types of investment as the explanatory variables that impact on GDP.

### 3 Fixed Assets Investment and GDP Relationship Modeling and Solving

#### 3.1 Data collection

My data is collected from the Internet, mainly from the National Bureau of Statistics of China and the China Statistical Information Network. The data covers the total GDP, the state-owned investment in fixed assets, the collective economic investment in fixed assets and the individual economy in fixed assets investment of Liaoning Province from 1995 to 2010(Unit: 100 million yuan). As follows:

**Table 1 Liaoning Province Data**

Year	GDP	State-owned fixed assets investment	The collective economy fixed assets investment	Individual economic fixed assets investment
1995	2793.40	584.87	79.56	45.31
1996	3157.70	544.66	102.83	69.30
1997	3582.50	573.76	97.36	87.16
1998	3881.70	651.21	119.26	100.33
1999	4171.70	662.95	140.00	121.42
2000	4669.10	649.42	154.13	149.10
2001	5033.10	690.71	158.7	179.08
2002	5458.20	648.90	173.54	240.19
2003	6002.50	712.22	229.49	335.16
2004	6672.00	930.59	326.43	523.53
2005	8047.30	1245.53	499.02	813.40
2006	9304.50	1700.33	185.30	1486.56
2007	11164.30	2051.43	278.71	2091.58
2008	13668.60	2496.84	442.12	3140.67
2009	15212.49	2845.47	480.72	4108.29
2010	18457.27	3875.48	504.36	5437.45

#### 3.2 The establishment of the model

According to the Keynesian model:  $Y=C+I+(X-M)$ , we can know that the investment is an important part of the gross domestic product (GDP), they are a positive correlation. So I created a multiple linear regression model.

Set: GDP is the explanatory variable  $Y$

State-owned fixed assets investment is variable  $X_1$

Collective investment in fixed assets is variable  $X_2$

Individual investment in fixed assets is variable  $X_3$

The initial model:  $Y=\alpha+\beta_1X_1+\beta_2X_2+\beta_3X_3+U_t$  (1)

**3.3 Economic significance test**

**3.3.1 Preliminary regression**

Preliminary regression to the original model, get the following results:

Dependent Variable: Y				
Method: Least Squares				
Date: 06/05/12 Time: 20:25				
Sample: 1995 2010				
Included observations: 16				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1091.664	906.2440	1.204603	0.2516
X1	3.843294	1.508762	2.547317	0.0256
X2	5.723170	1.830148	3.127162	0.0087
X3	0.047129	0.897984	0.052483	0.9590
R-squared	0.985050	Mean dependent var	7579.773	
Adjusted R-squared	0.981313	S.D. dependent var	4734.256	
S.E. of regression	647.1757	Akaike info criterion	15.99543	
Sum squared resid	5026036.	Schwarz criterion	16.18858	
Log likelihood	-123.9634	Hannan-Quinn criter.	16.00532	
F-statistic	263.5649	Durbin-Watson stat	0.901043	
Prob(F-statistic)	0.000000			

**Figure 1 OLS Regression Results**

Model estimation results:

$$Y=1091.664+3.8433X_1+5.7231X_2+0.0471X_3 \tag{2}$$

(1.2046)(2.5473)(3.1272)(0.0525)

$$R^2=0.9851 \quad F=263.5649 \quad D.W.=0.9010$$

It can be seen that the model parameters are positive, the state-owned economy, collective economy and individual economy of these three fixed-asset investment and GDP showing a positive correlation, in line with economic theory. R<sup>2</sup> (coefficient of determination) =0.9851, modified coefficient of determination is 0.9813, which indicates the model's goodness of fit is very good, the fixed assets investment has a strong explanatory power to GDP.

F-test, under significance level 0.05, check the degree of freedom in the F distribution table for k = 3, n-k-1 = 12 the critical value F<sub>0.05</sub>(3,12) =3.49, obviously F = 263.5649 greater than 3.49, shows that these three type of investment in fixed assets together have a significant impact on GDP.

T-test, under significance level 0.05, check the degree of freedom 12 in the T distribution table , the critical value T<sub>0.025</sub>(12)=2.18, seen from the results, X<sub>3</sub> T-test is not significant, the influence of the state-owned fixed assets investment and individual economic fixed assets investment on GDP is significant, but the collective economic investment in fixed assets in this model do not show a significant impact on GDP, which may be the existence of multicollinearity.

**3.3.2 Multicollinearity inspection and correction**

	X1	X2	X3
X1	1.000000	0.804124	0.993738
X2	0.804124	1.000000	0.795947
X3	0.993738	0.795947	1.000000

**Figure 2 Correlation Coefficient Matrix**

As can be seen from the correlation coefficient, there is a correlation coefficient greater than R<sup>2</sup>, so the model has multicollinearity.

The following, use the stepwise regression to correct the explanatory variables. X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub> were regressed to y respectively by using ordinary least-squares, have:

$$Y=1554.119+4.6208X_1 \tag{3}$$

(4.6212)(22.4002)

$$R^2=0.9729 \quad F=501.7695 \quad D.W.=0.5067$$

$$Y=1016.593+26.4409X_2 \tag{4}$$

(0.8330) (6.2714)

$$R^2=0.7375 \quad F=39.3308 \quad D.W.=1.3289$$

$$Y=4288.503+2.7821X_3 \tag{5}$$

(14.1128) (18.3237)

$$R^2=0.9600 \quad F=335.7579 \quad D.W.=0.2378$$

Explanatory variables in order of importance,  $X_1, X_3, X_2$

With the first equation  $Y = 1554.119 + 4.6208 X_1$  as the foundation, followed by the introduction of  $X_3, X_2$ .

First introduce the  $X_3$  to the model, have

$$Y=1472.275+4.7613X_1-0.0857X_3 \tag{6}$$

(1.2666)(2.4856) (-0.0738)

$$R^2=0.9729 \quad F=233.0648 \quad D.W.=0.5252$$

When  $X_3$  is added, its coefficient is negative, because the fixed asset investment and GDP is a positive correlation, so this is inconsistent with economic theory, and did not improve the  $R^2$ , T - value does not pass inspection, so remove the  $X_3$ .

Then  $X_2$  introduced into the model, have

$$Y=1047.059+3.9211X_1+5.7186X_2 \tag{7}$$

(3.4642)(14.6705) (3.2556)

$$R^2=0.9850 \quad F=428.1932 \quad D.W.=0.9110$$

After introducing  $X_2$ ,  $R^2$  slightly increased, its coefficient is through the T-test, so keep  $X_2$ . State-owned economy investment in fixed assets and collective economy investment in fixed assets both have a significant impact on GDP.

In summary, for this model, the  $X_3$  is redundant, should be removed. New fitting results are as follows:

Dependent Variable: Y				
Method: Least Squares				
Date: 06/05/12 Time: 20:34				
Sample: 1995 2010				
Included observations: 16				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1047.059	302.2528	3.464184	0.0042
X1	3.921121	0.267279	14.67054	0.0000
X2	5.718627	1.756583	3.255541	0.0063
R-squared	0.985047	Mean dependent var	7579.773	
Adjusted R-squared	0.982746	S.D. dependent var	4734.256	
S.E. of regression	621.8576	Akaike info criterion	15.87066	
Sum squared resid	5027190.	Schwarz criterion	16.01552	
Log likelihood	-123.9653	Hannan-Quinn criter.	15.87808	
F-statistic	428.1932	Durbin-Watson stat	0.911008	
Prob(F-statistic)	0.000000			

**Figure 3 OLS Regression Results**

$$Y=1047.059+3.9211X_1+5.7186X_2 \tag{8}$$

(3.4642)(14.6705)(3.2556)

$$R^2=0.9850 \quad F=428.1932 \quad D.W.=0.9110$$

At this point, the model's goodness of fit is high, the T-test and F-test are passed. The influence of state-owned economy investment in fixed assets and collective economy investment in fixed assets on GDP is significant. They are positively correlated.

### 3.3.3 Autocorrelation inspection and correction

Test with LM method:

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	4.254944	Prob. F(1,12)	0.0615
Obs*R-squared	4.188209	Prob. Chi-Square(1)	0.0407

**Figure 4 Autocorrelation Inspection Result**

Because  $TR^2=4.1882 > \chi^2_{0.05}(1)=3.841$ , so there is autocorrelation. This may be due to the inertia of reasons, most economic time series has autocorrelation, its current value is often affected by lag phase, GDP and fixed asset investment will slowly change over time, thereby build models lead to the error term autocorrelation.

I use the Generalized Difference Method to correct autocorrelation.

Dependent Variable: GDY Method: Least Squares Date: 06/05/12 Time: 21:11 Sample (adjusted): 1996 2010 Included observations: 15 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	899.1643	171.9562	5.229031	0.0002
GDX1	3.939377	0.194927	20.20949	0.0000
GDX2	2.769213	1.092663	2.534371	0.0262
R-squared	0.981790	Mean dependent var		4163.104
Adjusted R-squared	0.978755	S.D. dependent var		2619.616
S.E. of regression	381.8229	Akaike info criterion		14.90465
Sum squared resid	1749464.	Schwarz criterion		15.04626
Log likelihood	-108.7849	Hannan-Quinn criter.		14.90314
F-statistic	323.4956	Durbin-Watson stat		1.119524
Prob(F-statistic)	0.000000			

**Figure 5 OLS Result After Correcting Autocorrelation**

Use  $GDY, GDX_1, GDX_2$  as sample, regressed again, have:

$$GDY=899.1643+3.9394GDX_1+2.7692X_2 \tag{9}$$

(5.2290) (20.2095) (2.5343)

$R^2=0.9818 \quad F=323.4956 \quad D.W.=1.1195$

The generalized least squares estimate of the model is:

$$Y=1976.1853+3.9394X_1+2.7692X_2 \tag{10}$$

(5.2290)(20.2095)(2.5343)

$R^2=0.9818 \quad F=323.4956 \quad D.W.=1.1195$

After correction, each index all through the test in the model, there is no autocorrelation.

3.3.4 Heteroscedasticity inspection

Use White Test to inspect heteroscedasticity:

Heteroskedasticity Test: White			
F-statistic	1.489312	Prob. F(5,9)	0.2840
Obs*R-squared	6.791597	Prob. Chi-Square(5)	0.2366
Scaled explained SS	1.283002	Prob. Chi-Square(5)	0.9367

**Figure 6 Heteroscedasticity Inspection Result**

Because of  $TR^2=6.7916 < \chi^2_{0.05}(5)=11.071$ , so the error terms of the model does not exist heteroscedasticity.

After a series of tests, I get the final model:

$$Y=1976.1853+3.9394X_1+2.7692X_2 \quad (11)$$

$$(5.2290)(20.2095)(2.5343)$$

$$R^2=0.9818 \quad F=323.4956 \quad D.W.=1.1195$$

#### 4 Conclusions

This paper collects the national economy annual statistical data of Liaoning Province of China from 1995 to 2010, uses econometric method, through multicollinearity inspection, autocorrelation inspection, heteroscedasticity inspection, conducts an empirical analysis to study the influence between GDP and fixed asset investment, mainly state-owned fixed assets investment and collective economy investment in fixed assets in the province from 1995 to 2010. The resulting model is  $Y=1976.1853+3.9394X_1+2.7692X_2$ . From the test result, we can see China's fixed asset investment and GDP exists between long-term stable relationship and the dynamic equilibrium mechanism. The correlation coefficient of the state-owned fixed assets investment and GDP is higher than the correlation coefficient of the collective economy fixed assets investment and GDP, which shows the state-owned fixed assets investment than collective economy fixed assets investment has a greater impact on the province's economic growth.

Through previous study, we can know that fixed asset investment and GDP is a linear positive relationship, which is consistent with the model I have got. According to a study of the relationship between Liaoning Province 1980 to 2010 fixed assets investment and its economic growth shows: there is a strong correlation between social fixed assets investment and economic growth, every 1% increase in investment in fixed assets can bring Liaoning Province national economy increase of 2.90 %. Based on this result, the author thinks presently investment in fixed assets in Liaoning Province efficiency is relatively low<sup>[3]</sup>. This conclusion and the model are also consistent.

China's fixed asset investment and GDP exists between long-term stable relationship and the dynamic equilibrium mechanism. Known from the previous model, the influence of state-owned fixed assets investment and collective economy investment in fixed assets on GDP is significant and the impact of state-owned fixed asset investment even more strongly.

From the test data we can see in the next few years, the main power of Liaoning economic growth will still come from rapid investment growth, investment rates will continue to keep higher level. Our province should not only keep the rapid growth of investment, but also to prevent overheating investment; both must play investment to economic growth impetus function, and to prevent the blind construction and low level repeated construction. This requires us to do: 1) insist on deepening the reform of the investment system<sup>[4]</sup>; 2) maintain investment in long-term stable growth; 3) determine reasonable investment scale, maintain a modest investment<sup>[5]</sup>; 4) grasp a reasonable investment structure, formulate rational investment direction.

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## Proactive Legal Involvement in Partner Selection Process

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**Abstract:** Using a partner selection process in the start of strategic alliances is not yet general practice. This is regarded as one of the reasons why many strategic alliances fail to be successful. The use of a structured partner selection process could be a way to build one's alliance capability and create a better fit and higher alliance performance.

In this paper, drawing from quantitative and qualitative research, we argue that alliances are more likely to increase alliance success when the partners pay particular attention to aspects with legal dimension within their partner selection process. Our key argument is that, as inter partner conflicts are the main reasons for alliance failure, by taking a legal perspective and providing adequate governance structure as instruments early on during the partner selection process, may diminish those conflicts and increase alliance success.

Our findings from a quantitative study among alliance professionals suggest that the use of negotiation and standard governance is highly effective in helping firms to increase their alliance success. As our study indicates that including clear steps regarding legal aspects of alliance selection, we further explored the role 'the law' (contracts and lawyers) plays and may play in (to optimizing) a successful selection process. We not only show the added value of taking a legal perspective, we also suggest which and when legal elements may be organized in such a way that they support a successful partner selection process.

**Key words:** Alliance management; Partner selection process; Legal involvement

### 1 Introduction

Governance conflicts and opportunism are often found to be the root of alliance conflicts and they often result in a lower level of alliance performance (Bell et al., 2006; Dacin et al., 2007; Dekker, 2008; Reuer & Ariño, 2007; Vlaar et al., 2007). Many conflicts and opportunistic behavior are either prevented or triggered by certain legal arrangements between the partners (Mayer & Argyres, 2004; Sampson, 2004). Contracts for example, can lead to agreement in a legally valid manner on strategy, demand competencies, and specific details of the roles, the responsibilities, and the collaboration process. If done properly, they facilitate collaboration and increase trust, whereas uncertainty and misunderstandings, on the other hand, increase the chance of conflict (Vlaar et al., 2007). Accordingly, legal aspects are necessary to give guidance and to control unforeseen events, and by incorporating them in the partner-selection process they may help to define partner expectations and to plan activities (Ryall & Sampson, 2003; Ariño & Reuer, 2004). There is therefore a clear role for legal aspects in the partner selection process when starting the alliance formation process because they often help to bridge the governance structures of the two partners and improve the selection process. The design of a legal framework may help partners to stay on course during the lifetime of the alliance.

Given its importance, it is surprising that only a few articles have been written about legal governance related to partner selection processes. There are some articles concerning the role of governance for alliances in general, but none considers which legal aspects need to be organized during the partner selection process. So far, alliance researchers tend to ignore the impact of legal aspects in partner selection processes. To fill this gap, this paper will empirically explore how alliance managers perceive the need to incorporate legal involvement in the selection process and procedure.

For this purpose two research questions will be investigated.

*Which legal aspects play a role and when do they need to be addressed over the life cycle of the partner selection process?*

This chapter starts with a review of the economic and legal literature on contractual arrangements and the partner selection process, including the role of negotiation and lawyers. The subsequent section describes how we gathered empirical material to measure the success of the use of legal mechanisms. We first describe which legal aspects may be organized in the partner selection process to enhance alliance success as valued by the expert panel and we design a framework to show when legal involvement is

necessary within the steps of the partner selection process. Finally we will analyze the added-value of lawyers and other legal involvement within the partner selection process. In the discussion section we will discuss the main results and provide several implications of our findings.

## 2 Theoretical Background

### *Economic and legal theory on contractual legal arrangements and the partner-selection process*

Two different perspectives—structural and relational—have contributed to the theory of alliance governance (Madhok, 1995; Powell, 1998). Based on transaction cost theory, the structural perspective assumes opportunistic behavior among partners (e.g., Williamson, 1985). It indicates that partnering expectations, the business plan, and the initial structural design combined with legal mechanisms such as contracts may prevent opportunism (Ariño & Reuer, 2005; Hennart, 2006). The other perspective is relational and based on social exchange theory (Blau, 1964); it assumes trust among partners. In contrast to the structural perspective, the relational approach indicates that trust and communication between partners lead to success because governance issues are handled with trustworthy behavior and good communication instead of legalities (Das & Teng, 2002; Salk, 2005).

Because of the specific focus of each perspective, other studies suggest combining the two (Bell et al., 2006; Doz, 1996; Reuer & Ariño, 2007; Vlaar et al., 2007). Using alliance evolution theory (Doz, 1996), these researchers assume that relational and structural/legal processes influence each other. They state that the design and application of structural elements (i.e., contracts) is related to relational processes such as the evolution of trust over the life cycle of the alliance (Faems et al., 2007). They point to the negotiation of the contract as a vital process in alliances because it leads to mutual interdependence and competence trust (Argyres & Mayer, 2007; Faems et al., 2007).

What is the added value of a structural-contracts perspective and taking lawyers' roles into account in partner selection? Contractual arrangements are considered to be catalysts, increasing or decreasing the chance of success of (pre)contractual relationships with legal experts as professionals influencing their contents and interpretation. This makes it worth examining their role during partner selection when the parties explore potential partners and make their initial promises. Even before a legal contract is signed the negotiations may have legal effect.

There are various reasons why contracts or legal documents describing bilateral agreements between parties are important in structuring relationships such as alliances. According to contract theory, collaboration processes do not always go smoothly without contracts (Shavell, 2003). For economists, this justifies the existence of contracts and the possibility of their enforcement by outside intervention (Craswell, 2000; Cooter & Ulen, 2007).

Economists stress several reasons for using contracts. First, contracts provide parties with a platform for interaction (Shavell, 2003; Polinsky & Shavell, 2007; Cooter & Ulen, 2007). Contracts enable people to coordinate their actions, and to specify what they agreed on, and to find jointly beneficial goals. Through contracts, parties specify the actions that they will take in the future, and contracts also allow them to share risk in mutually beneficial ways (Shavell, 2003).

Secondly, contracts help to delimit the range of acceptable behavior. Because contracts are enforceable by law, they help to secure optimal commitment and reliance. Economic theories on the importance of this enforcement base it either on the utility created by the eventual performance of the promise (welfare is usually increased by carrying out a promise) or on the utility created by the ex-ante incentives of the promise supported by a general rule of enforceability (Craswell, 2000; Goetz & Scott, 1981; Shavell, 1991; Katz, 1998). The incentives creating an efficiency gain are, for instance, the incentive for the promisee to rely on the promise made by the promisor by agreeing on a rule requiring compensation, or measures for a better allocation of the risks if the parties differ in their attitude towards risk. Such incentives may encourage telling the truth about the conditions that will affect performance (Craswell, 2000; Goetz & Scott, 1981; Shavell, 1991; Katz, 1998).

Thirdly, there are costs involved in negotiating and enforcing promises (transaction costs)

(Klaes, 2002; Williamson, 1985; Williamson, 2002). The assumption is that if such costs did not exist, rational actors would come to mutually beneficial terms (Ulen, 1999). Contracts are expected to reduce transaction costs because the parties agree on how they will work together over a period of time (Masten, 2000). Therefore, entering into a contract reduces the prospect of costly, repetitive bargaining. The parties minimize the transaction costs of negotiation by supplying efficient default terms and regulations for their relationship.



Finally, contracts may provide means for dispute resolution. Most contain a paragraph on the applicable law and legal authority. Detailed conflict-resolution techniques may be included in contracts or a reference to the applicable conflict-resolution rules. In summary, a contract is a mechanism that supports the parties' collaboration process, and contract law acts as a backup in case parties fail to regulate an issue or obligation explicitly (Cooter & Ulen, 2004).

In the partner-selection process these tasks are relevant because enforcement possibilities help partners to trust each other and make the collaboration more smooth during the selection stage. Contractual arrangements allow them to coordinate their interaction, to secure commitment and reliance, and can lower the costs of negotiation by providing clear agreement or rules. Finally, identifying conflict and deciding how conflict will be resolved at the earliest stages of a contractual relationship can prevent subsequent problems.

*Role of negotiation and lawyers in the partner-selection process*

The steps of negotiation are as follows ((Menkel-Meadow, 2000; Wilson, 1995): the parties start to negotiate, develop a relationship, identify potential differences of opinion, and plan how to deal with them. Negotiation processes are fundamental to successful selection and collaboration. They develop relationships between people and entities. They also allow for interactions in order to foresee conflict and plan conflict management. Because the alliance partners interact over time, the relationship matters. Through negotiations with the other party a bond is developed and a relationship created. The process of alliance management also involves this. The parties' relationship is a key variable for successful collaboration. One may perceive the parties' relationship as their vehicle for cooperation. A good relationship facilitates interaction and communication, makes transactions more efficient and therefore less costly, and creates a bond between the parties (Kritzer, 1991; Menkel-Meadow et al., 2005). It facilitates the growth of trust between the cooperating partners and their representatives. Moreover, a good relationship creates a mutual dependence that may further strengthen the bond.

The process of developing a relationship that allows the parties to achieve their goals mainly takes place through negotiations (Boddy et al., 2000). First, the client develops a relationship with a number of potential partners. After the selection of a partner, the relationships with the other candidates end and the relationship with the selected candidate intensifies. The companies enter into a contract and may create a legal partnership to facilitate their cooperative actions. The relationship continues to develop during the collaboration process (Dacin et al., 2007; Dekker, 2007; White & Lui, 2005).

Lawyers are often regarded as a necessary evil and unhelpful in ensuring a successful start of this collaboration process (Barondes, 2001). However, lawyers may fulfill a variety of roles in the design of legal arrangements and their negotiation and interpretation. They are expert designers and negotiators of contracts. Lawyers and other legal professionals help to provide explanations and guidance in legal matters. In some situations their involvement is helpful, either as representatives in court proceedings, as drafters of complex contracts, or as specialists in legal systems that are often daunting in their complexity.

For these reasons, lawyers play important roles in legal negotiations (Menkel-Meadow, 2000). Legal negotiations have been defined as "negotiations (between parties) with lawyers in the middle and legal institutions in the background." Lawyers' role and approach will depend on the goal of the negotiations. The goal may be deal making and conflict resolution before and during litigation. During partner selection lawyers may be of value because the partners are about to enter into a contract. Lawyers may assist in identifying potential conflict issues or try to solve conflicts early on and provide for elaborate dispute-resolution mechanisms. Lawyers may also help to manage the commitment process during the negotiations (Mnookin et al., 2000).

In negotiations, the presence of lawyers enhances the "shadow of the law" because of their thorough knowledge of the law and legal cases. They use this knowledge to bolster their arguments. Thus, investing in a sound legal framework and involving lawyers at the early stages of an alliance relationship may increase the chances of success.

Earlier we referred to their role as a necessary evil. This is because lawyers are trained to take a distributive negotiation approach (dividing goods or money with a zero-sum approach) (Kritzer, 1991; Menkel-Meadow et al., 2005). Research indicates that this is the usual approach in legal

proceedings and contract negotiations, and it fits with the organization of the legal system. The literature observes that involving lawyers in negotiations has disadvantages (Salacuse, 1998; Mnookin & Susskind, 1999). Legal professionals are trained in the distributive negotiation method that is characteristic of the legal system (Menkel-Meadow, 2000; Kritzer, 1991).

In a traditional legal approach, distributive bargaining competition and the defense of one’s position are paramount. If one lawyer initiates competition, the other will most likely follow suit (matching behavior; e.g., Murnighan & Roth, 1983; Ury, 1991). Thus, lawyers may increase competition and the chance of conflict. This may threaten the collaboration process between the alliance partners, if not during the partner-selection procedure, then in the subsequent stages.

Although prior studies have addressed the issue of alliance success and legal relationships, the literature is affected by two sets of limitations. First, research has been done from either a business perspective or a legal perspective, and there is no integration of these viewpoints. Moreover, studies (Dacin et al., 2007; Dekker, 2007; White & Lui, 2005) may argue the influence of legal issues on alliance formation but fail to investigate the influence in depth by doing research into why and how legal aspects affect the early stages of alliances or which legal measures improve the partner-selection process. Legal studies state the importance of alliance contracts and the use of lawyers, but they do not indicate how to integrate them into the partner selection process (Hennart & Reddy, 1997; Mayer, 2003; Reuer & Ariño, 2002, 2003; Vlaar et al., 2007).

This research follows the structural perspective based on transaction cost theory and it will give insights into the importance of legal involvement including how and when legal involvement may be incorporated in the partner selection process.

### 3 Data Collection and Methodology

A survey was carried out to gather data on firms’ partner-selection processes and criteria. This quantitative analysis is in line with numerous other studies in the field of alliance research (Anand and Khanna, 2000). The survey questionnaire was sent to 500 alliance managers worldwide. The membership database of Alliance Best Practice (ABP) was used to direct the questionnaires. ABP is an internationally oriented company that helps companies to accelerate their partnering efforts with reduced risk by benchmarking them against a proven best-practice database of collaborative experience (see [www.alliancebestpractice.com](http://www.alliancebestpractice.com) for more information).

The goal of the survey fits well with the aims of ABP. First, ABP has members worldwide from a wide variety of industries, as can be seen in Table 1. Secondly, by using the ABP database, we could contact top alliance managers who could give key information on partner-selection processes and criteria. According to Tippins and Sohi (2003: 757) and Kale et al. (2002), the use of key informants is currently the standard methodology in corporate-level strategic research.

**Table 1 Clients of ABP**

IBM (USA)	Rolls Royce	Eli Lilly	Reckitt Benckiser	Vodafone
IBM (UK)	KLM	StorageTek	uLogistics	Starbucks
Bank of America	Kuehne & Nagle	GSK (Healthcare)	CSC	AstraZeneca
Siemens	TNT	Cap Gemini	Nortel	Alcatel
BT	Micro Focus	Bax Global	Microsoft	Air France
Computacenter	HP (UK)	Exel	Oracle	Delta Airlines
				Cognos

Source: ABP (2008)

The survey technique was designed to receive as many responses as possible (Rea & Parker, 2002). Three techniques were used to optimize the response rate: a digital questionnaire with a clear design, reminder messages, and incentives. To obtain information about which steps, criteria, and tools are critical for the partner-selection process, the questions referred to a firm’s entire alliance portfolio. We do not analyze individual alliances because we expect that microlevel mechanisms have a similar impact on all of a firm’s alliances. Most of the survey questions were closed and respondents were asked to give answers on a 1- or 5-point Lickert-type scale. The survey instrument was created and pretested with the help of several experts to erase any aspects that could cause bias.

Academic researchers checked the relevance and operationalization of the survey, and eight alliance managers tested the terminology and clarity. In addition to pretesting the questionnaire, the alliance managers were also interviewed after the survey had been conducted, to verify the empirical findings and to validate arguments for expected and unexpected results. These people were selected

based on their knowledge and ability to contribute to the research.

Respondents were assured that their responses would be treated confidentially and that the results would be put on the ABP website and an executive summary would be sent to them. Via the ABP constant-contact system, a personalized email containing the survey was sent to the ABP membership database. A reminder email was subsequently sent to optimize the response rate. The original message was repeated because some people had discarded it.

The following incentives were offered to maximize the response rate (Larson & Chow, 2003):

1) Respondents could gain insight into the latest developments in alliance management; the results were made available via [www.alliancebestpractice.com](http://www.alliancebestpractice.com) and a report discussed them was emailed. Respondents could therefore benchmark their performance with that of their peers.

2) ABP offers 110 tools on their website. Temporary membership was offered to those who filled in the questionnaire so they could choose four tools or research pages to use for their own purposes.

The survey was sent to 500 alliance managers; they form the total population of this study. We received 150 responses, and after excluding incomplete and/or incorrect surveys, the final response rate was 20% because 100 responses could be used effectively. This is a good response; most international mail surveys in strategic management have a response rate between 6% and 16% (Harzing, 2002; Kale et al., 2002; Snow and Thomas, 1994). The main reason for these low response rates is the large number of surveys that alliance managers receive (Zollo et al., 2002).

As mentioned earlier, the sample consisted of 100 alliance managers from a variety of industries (see table 2): consultancy (25%), IT (23%), health (4%), software (18%), financial services (3%), air transport (4%), education and public sector (2%), process industry e.g., Philips (13%), and pharmaceuticals/biotechnology (8%). The alliance managers responded to the survey with regard to their most important alliances and in total the dataset reports on 992 important alliances.

**Table 2 Primary Industry of Each Company**

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Consultancy	25	25.0	25.0	25.0
	IT	23	23.0	23.0	48.0
	Health	4	4.0	4.0	52.0
	Software	18	18.0	18.0	70.0
	Financial services	3	3.0	3.0	73.0
	Air transport	4	4.0	4.0	77.0
	Education	2	2.0	2.0	79.0
	Process industry	13	13.0	13.0	92.0
	Pharmaceuticals and biotechnology	8	8.0	8.0	100.0
	Total	100	100.0	100.0	

The next tables show the distribution of the size of the firms, measured on the basis of the number of employees and the total worldwide sales volume last year in Euros. We see that 39% of the firms have between 1 and 500 employees and 55% have over 1000 employees. This indicates that a balanced set of firms is represented in the sample data. With respect to the total worldwide sales volume, the largest group of respondents (31%) is found between 1 and 50 billion Euros and again a balanced set of firms is represented.

**Table 3 Number of Employees**

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	0	1	1.0	1.0	1.0
	1–500	39	39.0	39.0	40.0
	500–1000	5	5.0	5.0	45.0
	>1000	55	55.0	55.0	100.0
	Total	100	100.0	100.0	

**Table 4 Total Worldwide Sales Volume Last Year in Euros**

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	0	1	1.0	1.0	1.0
	<1 million	18	18.0	18.0	19.0
	1 million to 100 million	27	27.0	27.0	46.0
	100 million to 1 billion	10	10.0	10.0	56.0
	1 billion to 50 billion	31	31.0	31.0	87.0
	>50 billion	13	13.0	13.0	100.0
	Total	100	100.0	100.0	

To ensure that the data were not biased by non-response, they were screened to determine if our sample was representative of the population (see Table 5). Three variables were analyzed: the number of employees, total worldwide sales, and the company’s overall success rate. Chi-square tests for each of these variables were performed. The results were compared to see if there were differences between early and late respondents on the assumption that late respondents can be compared to non-respondents (Armstrong and Overton, 1977).

All the variables have a p-value >5% indicating that there is no significant correlation between item scores and survey response time. So there was no significant non-response bias in the dataset. Moreover, the average success rate in the last five years was 57%. This means that 57% of the alliances realized their initial goals, which is comparable to the results of other studies on alliance performance (Park and Ungson, 2001). In conclusion, the results indicate that the dataset was valid and not influenced by non-response bias.

**Table 5 Number of Employees \* Response time  
Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.411(a)	12	.275
Likelihood Ratio	16.337	12	.176
Linear-by-Linear Association	4.251	1	.039
Number of Valid Cases	100		

**Table 6 Total Worldwide Sales Volume Last Year in Euros \* Response time  
Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	31.230(a)	20	.052
Likelihood Ratio	32.697	20	.036
Linear-by-Linear Association	5.026	1	.025
Number of Valid Cases	100		

**Table 7 Company’s Overall Success Rate in The Last Five Years \* Response time  
Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	93.950(a)	76	.080
Likelihood Ratio	101.138	76	.029
Linear-by-Linear Association	1.150	1	.283
Number of Valid Cases	100		

We adopted a design approach to validate our results (Van Aken et al, 2007). This design approach is relevant to management research because of its evidence-based research and the information by practice (Vermeulen, 2005; Chatman and Flynn, 2006). We followed the following steps of the design process ( van Aken, et al. 2007) over the course of this study:

1) *Identifying the research problem:* There is little literature on the partner selection process including legal involvement. Hence, details on the problem will be obtained in the studies in this chapter.

2) *Seek inputs for the design:* Design research employs both quantitative and qualitative methods (Laurel, 2003). In this chapter, the goal is to gather inputs from the literature and from experts that can be used to develop a design solution for the research problem. We made use of expert interviews to validate the role of these issues and how to design a successful framework. The reason these unscripted interviews were held was to determine the necessity of legal involvement for a successful partner-selection process. These experts were selected on the basis of their knowledge and ability to contribute to the research. We talked to 12 alliance managers with an experience ranging from 5 to 20 years managing alliances and working in close collaborations with their business partners overtime. They were presented with legal involvement aspects within the partner selection process and were asked how often discussions arise about these points. They were also asked to rate them in order of relevance when including these elements as part of the governance structure and/or the legal framework. We also interviewed 10 legal experts from both academia and practice, including 2 working in legal academic faculties from the Netherlands, 2 lawyers practicing at law firms and 6 legal in house experts from companies involved in alliances. We focused on the role they believe legal involvement e.g. contracts and lawyers do and may play in facilitating cooperation.

3) *Developing the design- from inputs to design:* We assimilated all the details from the quantitative and qualitative research and we gathered ideas and principles involved. Finally, we came up with the following design idea: the steps in a structured partner-selection process partly correspond with the relationship development stages identified in the alliance literature. We used the stages of relationship development as identified by Wilson (1995) and others as categories for the factors that influence collaboration. We designed a legal framework dealing with all the issues that may be organized in the partner selection process.

4) *Design justification and validation:* The design concept of this paper has been validated by subjecting the legal framework to assessment by alliance managers. We used some of the experts out of step 2 of this design study, but we first contacted respondents of the overall questionnaire to ask for their feedback. The interviews were held as an extra measure to falsify the findings from the empirical studies (those mentioned in paragraph 2) on the factors in legal frameworks that influence cooperation. To be able to obtain results that would help to generalize for alliance situations, the focus was on the experts' experience in several partner selection processes over the last 10 to 15 years. This way we were able to get insights on the experiences of managers in a number of alliances in which various approaches in partner selection were used. In the interviews we primarily discussed the experts' perceptions of the accuracy of the legal involvement aspects we found: Whether we found the right aspects or not, and whether aspects were missing.

This form of validation is more appropriate since what is needed is the assessment of its feasibility. The design is validated when the alliance managers who assess the designed framework, find it useful and wish to adopt it. Feedback from the experts enabled us to assess the feasibility of the designed framework.

#### **4 Analysis and Results**

We asked our respondents how contracts and lawyers are used and how they influence success. This may shed light on different partner-selection tactics and their effectiveness in creating value from alliances. Only 11.5% of the respondents are positive about the effect of lawyers on partner selection; 26% state that more than half of their alliance breakdowns were caused by interpartner conflicts. More than half of the respondents use a legal/contractual document in their partner-selection process. Accordingly, it may be that managers are using contractual documents and lawyers, perhaps because of their former experience with interpartner conflicts. However, they may not use them effectively because former analyses did not indicate the importance of documents and lawyers.

Finally, experts were asked to value which legal issues need to be organized in the partner selection process to enhance alliance success. First, negotiation was perceived as the only aspect that needs to be organized. In the negotiation process all elements of the alliance need to be discussed, and the intense interaction between the partners will give them a feeling for the feasibility of the alliance from a cultural and personal-chemistry viewpoint. Secondly, experts agree that the way legal structure, legal culture and organizational structure of the partner organization is organized, is less frequently used when selecting a

partner. Experts believe that if not paid attention to, legal differences may particularly surface when conflicts arise. Parties may have the feeling of a loss of control. Different structures may apply than they are used to, they may be unfamiliar with the other's culture for dealing with conflicts (e.g., adversarial approaches as opposed to collaborative approaches), and the legal structure may differ leading to differences of opinion about dealing with legal matters. These issues may drive partners apart. Accordingly, experts state that comparing decision-making procedures to govern the alliance may be organized in the beginning of the partner selection process: the chance of conflict is increased when there are fundamental differences in decision-making procedures. Addressing the issues that lead to conflicts may decrease the chance of them arising. This discussion should be a part of the selection process. This can be addressed at meetings early in or before the contractual relationship. A failure to make decisions adequately is also found to lead to the failure of relationships. The resulting bureaucracy causes delay and frustrates both parties. By addressing decision-making procedures during the selection process parties may identify potential problems and be able to agree on mandates. Finally experts state that the use of pre-contractual issues like standard governance and a joint business-planning workshop including the relevance of contracts and lawyers are most effective in helping firms to improve their success so they may be organized in the beginning of the partner selection process.

In the following sections we will present a legal framework and explain how and why the issues identified by the second expert panel may be used in the partner-selection process.

#### *Role of a legal framework in the partner-selection process*

In the literature on organizational relationships, the process of creating and maintaining a relationship is subdivided into a number of phases (Boddy et al., 2000).

Researchers distinguish the following stages in the development of long-term legal relationships (Wilson, 1995):

- 1) First contact
- 2) Discussing the purpose of the relationship
- 3) Agreeing on how the contract will be structured
- 4) Finalizing and writing the agreement
- 5) Creating value through joint efforts
- 6) Renegotiating the agreement
- 7) Concluding the alliance relationship

A legal structure for successful alliances should facilitate the steps of the alliance-selection process and help to prevent or overcome the factors that lead to alliance failure (mistrust, disappointment). During the partner-selection process as defined in Table 4.1, the alliance partners cover the first four stages of relationship development as mentioned above. They use negotiations to get from one stage to the next. Combining the process with 'management and organization' issues creates a framework that supports the development of a relationship. We now list a design as what a partner-selection process ideally provides following a legal structure. Figure 1 and 2 are elements from the pre-contractual phase, which influence the juridical aspects of the contractual phases from figure 3 and further. This pre-contractual phase considers preparation, negotiation and joint business planning before the execution of the alliance contract. This is essentially an internal process which plays a central role in the alliance process. The ultimate objective is to achieve a thorough understanding of the target process, so that the partners can make informed decisions about whether it should ally, and about price, risk and intentions. This will also allow the team members to get to know each other, become acquainted with the different skills and share information.

Negotiations often end with the drafting of business principles or heads of agreement. The latter is a document that lays down all important principles and agreements on which the parties have decided after negotiations. This agreement is the starting point for the contractual phase in which all the aspects and decisions made in the pre-contractual phase will be used in the final alliance contract. Accordingly, the legal framework from the contractual phase is dependent from content and relation as developed during the pre-contractual phase. Figure 1 and 2 influence the final juridical contract of an alliance as written in the contractual phase from figure 3. Legal involvement cannot be separated from the management and organization aspects like joint business planning. They influence each other, without negotiation and joint business planning, a contract cannot be made.

#### **The first contact (step 7):**

1) *First contact*. People start building a relationship from the first time they meet. At this stage the individuals are getting to know each other (the social bonding process), and reputations for performance

and trustworthiness are tested and built. This is the phase of contact and partner selection and includes the general exploration of the goals of the relationship through negotiations. (For a relationship-marketing perspective see Achrol (1997)). The relationship is still poorly defined, and the requirements are still unclear; however, the parties look to develop interpersonal relationships, and trust may start to develop (Ford, 1982, 1998; Thompson & Sanders, 1998). Figure 1 shows the legal framework for step 7 of the partner-selection process during the first contact.

1. The initiator sets the tone for the relationship with cooperative strategies that will inspire the less powerful party to react in the same way.
2. To build trust the initiator is transparent about the selection procedure; for example, the initiator will provide clear selection criteria, provide a clear tendering procedure, encourage open information exchange, and be willing to explain and inform.
3. The initiator describes the guidelines and principles that are central in the relationship.
4. The parties agree on the norms for the negotiations that take place during the selection process and make them part of the agreement (Ellickson, 1991).

**Figure 1 Framework for Step 7 of the Partner-Selection Process: The First Contact**

*A. The purpose of the relationship (steps 9–13):*

2) *Discussing the purpose of the relationship.* Subsequently, the persons involved start defining the exact purpose of the relationship and its terms. At this stage the parties try to find a balance between shared goals and individual goals; they clarify mutual goals and set the boundaries of the relationship. Regulations for the exchange between the parties start to develop (Ford, 1982; Boddy et al., 2000; Wilson, 1995). Social bonding becomes more established, mutual goals are formulated, and trust increases, which strengthens the bond between the parties. Figure 2 shows the legal framework for steps 9–13 of the partner-selection process during the discussion of the purpose of the relationship:

1. Share information on the subject of the relationship.
2. Be clear about intentions and willingness to enter into a contractual relationship and agree on penalties or other mechanisms to apply if negotiations are broken off without sufficient reason.
3. Determine what both parties expect from the relationship and how they define a relationship that works.
4. Determine whether there is enough of an overlap in desires between parties and a chance for profitable future encounters.
5. Determine if and how the parties' long-term self-interest is served before making a commitment to the relationship.

**Figure 2 Framework for Steps 9–13 of Partner-Selection Process: Discussion of the Purpose Of the Relationship**

**How the contract will be structured (steps 13 and 15)**

3) *Agreeing on how the contract will be structured.* More detailed structuring and ordering of the relationship occurs at this stage. The parties negotiate in more detail the goals of their relationship, the conditions for reaching those goals, and the terms of their agreement. This happens through a bargaining process, resulting either in an agreement to work together to achieve their goals or the end of the negotiation. There are many reasons that this is important and omitting this step will increase the chance of conflict and alliance failure. By writing contracts together the parties can choose to take a more collaborative (or integrative) approach.

This is the stage at which goals become concrete and misunderstandings may surface. Provided the parties discuss goals in a broad sense this is unlikely. When the goals are translated into duties, rights, and responsibilities they become more concrete and opposing interests typically surface at this point. If this step is not done thoroughly, the parties may fail to discover the misunderstandings that could be addressed at this early stage. This may lead to subsequent friction about the contract. Moreover, the

writing of the contract itself may threaten the alliance. There can be an essential mismatch between the idea and the structure of the alliance form (sharing) and the way in which legal contracts and legal thinking in general are structured (dividing). As a result, the concept may lose its collaborative spirit when it is translated into a legal document. Thus, contracts may constitute a threat to an alliance. A collaborative contract-drafting effort is necessary to counter this effect. Figure 3 shows the legal framework for steps 13 and 15 of the partner-selection process during the discussion of how the contract will be structured.

1. The partners agree to invest in the relationship and specify how these investments will be made.
2. The partners use the bandwidth that the legal system provides because it enables them to establish a framework that optimally contributes to a cooperative relationship.
3. They are aware that a strong imbalance in power may frustrate a balanced relationship and be a disincentive for cooperative behavior.
4. The contract contributes to a cooperative relationship by stating the rights and obligations of the parties; providing a detailed set of rules and procedures for resolving disputes; and providing a legal framework in which future negotiations over the terms of trade will take place.
5. The contract is a “blueprint for exchange” and a means to plan the collaboration, to set partner expectations, and, consequently, to reduce misunderstandings and costly missteps.
6. The contract includes elements of collaboration that help to clarify the parties’ intentions even if they are not legally enforceable.
7. The contract defines the precise meaning that the parties attach to abstract concepts such as rules of respect, fairness, and reciprocity.
8. The contract facilitates mechanisms in a relationship that allows both parties to reward cooperative behavior and punish defective behavior.
9. The partners should be aware that the framework for a relationship, particularly the contract, may reflect and amplify unwanted power differences.
10. The partners should consider integrating social norms into the different phases of the relationship-building process, because they may complement the contract and prevent problems particularly for the parts of the agreement that are hard to enforce legally.
11. They should deal with conflict.
12. The partners should choose among the options in conflict management, such as the level on which to deal with conflict, and discuss this early in the collaboration process.
13. The partners should estimate the likelihood of conflict, discuss how to react to conflict-inducing behavior, and share information about such behavior.

**Figure 3 Framework for Steps 13 and 15 of Partner-Selection Process: Discussion of How the Contract Will Be Structured**

**Finalizing and writing of the agreement (step 15):**

4) *Finalizing and writing the agreement.* When the parties reach agreement on the goals of the relationship they start formalizing (writing down in a contract) what they have agreed. At this stage the conditions of the relationship and its boundaries are formalized (Wilson, 1995). The parties create a document in which the promises are summarized: the contract. The first step in cooperation is getting to know a partner, to discover compatible aims and a willingness to share ideas and to develop them further together. This is an important stage because the rules formulated govern the relationship. A lack of clarity about the terms of the agreement can lead to subsequent disagreement about what was decided.



Decision making procedures is not a standard element of contracts (Polinsky & Shavell, 2007; Cooter & Ulen, 2007). As a result, the parties tend to fail to discuss this. The literature on dispute system design (Albers, 2005; Argyres, N. & Mayer, K.J. 2007; Vlaar et al. 2007). suggests that agreeing on clear decision-making steps (in particular for conflict-resolution processes) at the selection stage will contribute to the early resolution of conflicts when they arise. Decision making between parties that are already in a conflict is difficult. A failure to be concrete about the process of working together can lead to conflict. Setting the tone early on (discussing how the parties deal with each other and what their beliefs are) prevents clashes later. Memoranda tend to be broad and nonspecific. This makes them easier to agree on but can lead to differences in interpretations. Figure 4 shows the legal framework for step 15 of the partner-selection process during the finalizing and writing of the agreement.

*What a framework following a legal structure for a partner-selection process ideally provides during the finalizing and writing of the agreement:*

1. Negotiate optimal outcomes based on relevant information while taking into account all possible options and drawing on accurate inferences.
2. Follow rational decision-making steps (define the problem, find criteria, give the criteria values, identify alternatives, test each alternative against the criteria, calculate the optimal decision, reach a decision, and act on it).
3. Work toward negotiation outcomes that satisfy both parties' preferences in the light of the ongoing negotiation process.
4. Use the freedom that the legal system provides for the content of the contract to tailor it to the relationship in the manner that best enables a successful collaboration process.
5. Discuss and consciously choose the legal regime that applies to the contract, because this choice impacts the way in which courts interpret the document.
6. Be specific on contract terms; define ambiguous terms; do not leave anything out; use terms consistently; and fully account for any sensitive issues (unless the parties want default rules to apply).
7. Agree on criteria for the contract interpretation rules; refer to them in the contract; and avoid ambiguity by being specific.

**Figure 4 Framework for Step 15 of the Partner-Selection Process: Finalizing And Writing of the Agreement**

### **5 Lawyers and the Added-Value of Legal Involvement within the Partner Selection Process**

The parties may want the lawyer to perform integrative negotiation to optimize the negotiation outcomes through a process of creating and distributing value. However, empirical findings show that an integrative negotiation approach is not commonly used by lawyers and is not well supported by the legal system.

Lawyers may be tempted to choose the distributive negotiation approach even if another approach will create a more mutually beneficial outcome (Gilson & Mnookin, 1995; Mnookin et al. 2000). However, the approach actually chosen by lawyers in a specific situation will depend on the goal of the negotiations and what they are asked to do by their clients. If a dispute has already emerged, the lawyer will most likely be a litigator trained in arguing a case in a court and will tend to have an adversarial style. A lawyer engaged to help with the commitment process, a so-called transaction lawyer, is more likely to have a cooperative style. Thus, the involvement of lawyers increases the danger of conflict escalation. Their involvement may encourage competitive behavior (Mnookin & Susskind, 1999). Therefore, the parties should weigh the benefits and risks of involving lawyers in their disagreements.

Lawyers may use their knowledge to facilitate collaborative negotiation and conflict resolution, but their use of the legal approach may also result in highly distributive contracts and the aggravation of conflicts (Gilson & Mnookin, 1995; Folberg & Golann, 2006). There are not many incentives that encourage lawyers to use the integrative negotiation method. It is not a method that the legal system facilitates or a strategy in which lawyers receive much training (Menkel-Meadow, 2000). Empirical research indicates that lawyers often undervalue creativity when dealing with conflicts and therefore may not look for creative win-win solutions (Kritzer, 1991; Mnookin & Susskind, 1999). Therefore, to prevent further escalation it is wise to choose a lawyer who is familiar with the negotiation method that a particular situation requires (Gilson & Mnookin, 1995).

Ideally, validated by experts, in the partner-selection process the partners will:

- 1) Anticipate the competitive effects of contracts and the involvement of traditionally trained lawyers.
- 2) Anticipate the escalation process that may result from the interaction between lawyers.
- 3) Involve lawyers in analysis of the problem at an early stage. Keep the threshold low, and try to prevent a conflict from becoming a legal problem.
- 4) Choose together the preferred level (self, together, with help of lawyers, or neutral) at which to deal with conflict.
- 5) Discuss and agree on a general approach and on approaches to particular conflict situations.
- 6) Choose problem-solving as the general approach to conflict resolution.
- 7) Agree on particular conflict-resolution styles for different conflict situations based on the type of conflict.
- 8) Make a trade-off between what is optimal for the collaboration process and the importance of the issue.
- 9) Avoid relational and task conflict, except in situations of pure difference of opinion where compromising or even forcing may be beneficial.
- 10) Agree on third-party conflict management processes.

## 6 Conclusion and Discussion

The results of this study reveal some interesting findings about the necessity of legal involvement in the partner selection process for alliance success. Our first research question asked which legal aspects play a role within the partner selection process?

We found that more than half of the managers use contractual documents and lawyers, perhaps because of their former experience with interpartner conflicts, but they are negative about the use of a lawyer. According to experts, the specific role of lawyers is closely related to the success of alliances. When these agents, experts at negotiating and structuring legal agreements, play a leading role and fail to steer the parties in the right direction they may do much damage. When instructed carefully they provide excellent support in drafting a contract. Accordingly, as stated in paragraph 4, this research does not conclude in line with the widespread idea of not involving lawyers in the early stage of the partner selection process (Barondes, 2001). If anticipating the competitive effects of contracts and the involvement of traditionally trained lawyers, and if anticipating the escalation process that may result from the interaction between lawyers, lawyers should be involved in analysis of the problem at an early stage. Keep the threshold low, and try to prevent opportunism and a conflict from becoming a legal problem.

Additionally, negotiation is perceived to be crucial in the partner selection process. In the negotiation process all elements of the alliance are discussed, and the intense interaction between the partners will give them a feeling for the feasibility of the alliance from a cultural and personal-chemistry viewpoint. Trust will evolve and opportunism will be prevented. Secondly, legal structure, legal culture and organizational structure need to be used more often as selection criteria. Experts believe that if not paid attention to, legal differences may particularly surface when conflicts arise. These issues may drive partners apart. Accordingly, experts state that comparing decision-making procedures to govern the alliance should be organized in the beginning of the partner selection process: the chance of conflict is increased when there are fundamental differences in decision-making procedures. Addressing the issues that lead to conflicts may decrease the chance of them arising. This discussion should be a part of the selection process. This can be addressed at meetings early in the contractual relationship. A failure to or bureaucracy delays to make decisions is also found to lead to the failure of successful

relationships. By addressing decision-making procedures during the selection process parties may identify potential problems and be able to agree on mandates. Finally, experts state that the use of standard governance and a joint business-planning workshop are most effective in helping firms to improve their alliance success so they may be organized in the beginning of the partner selection process.

Our second question asked how to address legal aspects within the partner selection process. Based on qualitative research, a legal framework has been developed that increases alliance success. For each of the stages of relationship development in a structured partner-selection process, we list important factors. As can be seen in figure 1 and 2, there are less legal aspects in these two pre-contractual phases. Although lawyers may facilitate these pre-contractual aspects, the real legal involvement starts afterwards in the contractual phases from figure 3 and further. Nevertheless, the pre-contractual phase is crucial because it influences the content and relation of the contractual phase, as stated in section 4.

Summarizing, legalities may be integrated in the partner-selection process to define partner expectations and to help plan activities. Despite its importance for the control of alliances, the partner-selection process and the integration of legal issues in this process have received scant attention in the literature and empirical studies. Our study aimed to enhance our understanding of the partner-selection process, its importance for alliance success, and the influence of legalities. It also indicated how not only taking into account the legal aspects but also using legal structures may increase success.

These results have implications for research. Our study adopted several methodological aspects common to a design approach in order to validate our legal framework. We see this as a start for further continuation of design research within partner selection specifically. Future management research may incorporate this start of design research to investigate further the practical usefulness more into detail.

Our research also has implications for the emerging literature on the added-value of legal involvement in the partner-selection process. To date this literature has hardly looked at the combination of legal aspects at different stages of alliance management e.g., the partner-selection process. It has not yet considered the use of legal issues in different alliance capabilities. This study shows that it is worthwhile to study in more depth individual processes and/or stages in combination with a legal framework. The next step in alliance-capability research may be to investigate how a legal framework is used at other stages and capabilities of alliance management, e.g., during the operation of the alliance or during its finalization.

Our results also have implications for management. Alliances are not only about alliance experience, trust, and informal governance. A structured, well-thought-out, legal framework for selecting partners performs better than a less-structured process. Investing in a rational and legal partner-selection process will therefore deliver value. Because the majority of alliance managers use legal documents, it appears that many companies have already combined the legal aspects with partner selection. However, there is still a negativity about lawyers and a lack of understanding of the importance of legal involvement in the partner-selection process. Companies are advised to revisit these aspects of the process.

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# Adoption of Project Portfolio Management as Organizational Innovation: Towards a Conceptual Framework

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**Abstract:** Project Portfolio Management (PPM) has the potential to bring considerable benefits to organizations. Although PPM should improve project success, not all project management (PM) based working organizations have fully adopted PPM as part of their way of working. This calls for thorough research. The topic of PPM Adoption has not received much academic attention so far. The positive link between PPM Adoption and portfolio success has been found by a few authors, but the circumstances under which PPM should be adopted represent an under-researched topic. We draw upon the concept of organizational innovation and portray the PPM Adoption as the implementation of a new organizational method in the firm's business practices. The paper develops a conceptual framework of PPM Adoption, considering PPM Adoption as movement along a spectrum, influenced by nine factors.

**Key words:** Project portfolio management; Organizational innovation; Portfolio performance

## 1 Introduction

As more and more companies start working in project-based environments, the interest towards project management starts growing too. One of the current topical subjects in project management is Project Portfolio Management (PPM). In a comprehensive literature review of project management research, Kwak and Anbari (2009) identify Strategy & PPM as “*the most important project management research subject (...) in the top management and business journals*”.

PPM has the potential to bring considerable benefits to organizations. For example, discussing the power of PPM, Pennypacker and Retna (2009) argue “*The potential benefits for the business can be immense*”. More specifically, Cooper et al. (2000) mention various benefits of PPM, some of which are financial reasons (return maximisation), maintaining competitive position and “to forge the link between project selection and business strategy”. De Reyck et al. (2005) conclude that a high level of PPM positively impacts project return and negatively impacts the number of project-related problems reported. Also, some authors approach this from the opposite perspective, describing situations that PPM helps to avoid. For example, Filippov et al (2010) indicate that PPM helps to effectively eliminate the wrong projects wrongly executed from a project portfolio. However, organizations struggle with successfully adopting PPM (Filippov et al, 2010; Blichfeldt et al, 2008), leading to lower PPM success (De Reyck et al, 2005) and eventually to financial consequences. To sum up, most publication on PPM generally view established PPM as a necessary determinant of project success (Teller et al, 2012; De Reyck et al, 2005).

As for the current practice, while the benefits of PPM are evident, seemingly not all project-based organisations have adopted PPM as the main way of business. Looking from a theoretical perspective, although a sizeable body of knowledge has formed within the field of PPM, this topic still offer ample opportunities for academic and practice-oriented research, and PPM Adoption is one of them. The concept of PPM Adoption has not received much academic attention so far, with some exceptions as Ajjan et al (2008). Filippov et al's (2010) PPM Saturation Model, relating the need for PPM to Organizational Project Complexity, is portrayed as a “*first attempt to determine the optimal period for introduction of PPM*”. The authors also argue that “*The question of when, under which circumstances and how PPM should be introduced is largely under-researched in the extant body of literature. PPM is usually treated as given or presented from a normative perspective – as ‘how PPM should look like’*” (Filippov et al, 2010).

The study of PPM Adoption is the main intention of the paper. The objective of this paper is to determine conditions and driving forces responsible for PPM Adoption in contemporary project-based organizations. To achieve this objective we develop a conceptual framework by conducting a thorough literature review, supported by expert interviews with project management practitioners.

## 2 Theoretical Background

### 2.1 Terms and definitions

We start the literature review with definition of key terms and concepts, such as project and portfolio management. 'Project' and 'Programme' are commonly recognised definitions by the Project Management Institute (PMI). The classic definition of a project is "*a temporary endeavour undertaken to create a unique product, service or result*" (PMI, 2006). In its turn, a programme is "*a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually*" (PMI, 2006).

As for the definition of 'project portfolio', we combine a classic definition of PMI (2006) with other definitions proposed in the literature, such as Martinsuo and Lehtonen (2007). Our proposed definition is as follows. *A project portfolio is a group of projects, programmes and other work that share and compete for the same resources and are carried out under the sponsorship of an organizational body with the purposed of achieving strategic business priorities.*

Project Portfolio Management is in its essence the process of managing project portfolios. Drawing upon a number of definitions, we can define it as *The process of selecting and prioritising projects in the project portfolio in order to align the portfolio with strategy, to balance resources and to optimise benefits, by means of centralisation and standardisation, as well as screening and monitoring of the projects in the portfolio.* The selection of projects is aimed at strategy alignment, resource balancing and benefit optimisation. In order to be able to make these selection and prioritisation decisions, good information is required, which is achieved through centralisation, standardisation, screening and monitoring.

As we have stated previously, the extant literature is modest in defining and describing the process of PPM Adoption. Most works on PPM (e.g. Teller et al, 2012) consider a workable PPM as given and do not address the aspects of a complex transition towards PPM. In our search for a definition of PPM Adoption, our first assumption is that PPM Adoption is not binary, e.g. either a company has sufficient PPM in place, or it has not. PPM is multifaceted and one aspect can be advanced while other aspects may be underdeveloped. As proposed by De Reyck et al (2005), PPM Adoption can be measured by multiple variables, each of them may be at a different level of maturity in a particular organisation. This can also be explained intuitively. Under the condition of finite resources, organisations always require and apply some mechanism for selecting what to do and what to drop. Levels of advancement of this selection mechanism may however differ. In the extreme forms, it could be the intuition of the CEO that determines the selection decision or there is a highly formalised system of methods and procedures for the selection of projects. Between these two extremes, many forms may exist. This intuition is corroborated by the organizational innovation literature. For example, Damanpour and Schneider (2006) argue that adoption of organizational innovation is not dichotomous. Hence, we opt to consider PPM Adoption as following a spectrum of advancement rather than a binary step. We define PPM Adoption as *a set of managerial decisions and actions to advance the current level of PPM in a specific organisation.*

## **2.2 Project portfolio management**

The section starts with a historical perspective on PPM, discussing the roots in Modern Portfolio Theory, and the contribution of Cooper's research on New Product Development, as well as the rapidly increasing attention for PPM over the last decades from academics as well as from professional associations like PMI and OGC. Next, the fundamental PPM element of project selection and its ideally repetitive nature is discussed, followed by a discussion on the location, range and scope of PPM in the organisation and a discussion on the differences and similarities of PPM Adoption with PPM Maturity Models. The section is concluded with an overview of research on the link between PPM Adoption and PPM success, as well as managerial challenges surrounding PPM.

As Kwak and Anbari (2009) write, the popularity of and interest in Project Management research has considerably increased over the last decades. Filippov et al (2010) state that organisations are moving from functional management towards Project Management as a way to organise work. They also state that this 'projectification' brings about 'project overload', leading to lower project efficiency as the human resources have too much to concentrate on, leading to lower task focus, lower adherence to time schedules and other similar issues. PPM is viewed as a mechanism to tackle this project overload.

PPM has its roots in Modern Portfolio Theory (MPT), which was initially developed for financial investments allowing to balance returns and risks (De Reyck et al, 2005). Later, MPT found another application area in Project Management. From the 1980's onward, academics started paying attention in PPM. The article by Roetheli and Pesenti (1986) describing the application of MPT in a Swiss pharmaceutical firm shows that in the 1980's MPT was already being applied to multi-project environments for balancing the various aspects of an organisation's set of projects, including risk,



duration and turnover. Meanwhile in the 1980's and 1990's, Robert G. Cooper and his colleagues applied portfolio theory to new product development projects, introducing the stage-gate system (Cooper, 1990). Cooper's work is considered as foundational in PPM research (Petit, 2012).

Over the last decade, the professional associations for project management have shown considerable activity regarding PPM, as can be observed from their publications of PPM standards and methods. The Project Management Institute (PMI), known for its Project Management Body of Knowledge (PMBOK) published the first edition of 'The Standard for Portfolio Management' in 2006, meanwhile succeeded by a second and a third edition (PMI, 2006). Also the British Office of Government Commerce (OGC), known best for the PRINCE2 best practice, has published the guide 'Management of Portfolios' in 2011 (OGC, 2011).

#### 2.2.1 PPM as a dynamic project selection process

One of the key objectives of PPM is the selection of projects (in line with the business strategy). A variety of models can be applied for this selection process. Meredith and Mantel (2010) categorise all selection models to numeric or nonnumeric. The nonnumeric models are those in which there appears to be no choice, as the project 'just needs to be done'. Among these models are the boss's 'sacred cow', operating necessity and competitive necessity. Also, more belief- or intuition-based models are distinguished, in which not much of a rational decision is made. "*Decision makers can act on their beliefs about what will be the likely impact on the total system performance*" (Meredith and Mantel, 2010). The authors mention the somewhat more structured 'comparative benefit model', in which senior management or a selection committee chooses project by intuitively ordering all potential projects.

As opposed to nonnumeric models, there are numeric models for project selection, relying on measurable indicators, comprising profitability models like payback period, net present value (NPV) and Real Options, as well as numeric non-weighted and weighted scoring models in which potential projects are evaluated by a pre-established list of criteria. Meredith and Mantel (2010) argue strongly in favour of weighted scoring models because they allow reflection of the multiple organizational objectives, their flexibility regarding changes in managerial philosophy or environment and their relatively low bias toward the short run, as compared to profitability models. Important criteria that ideally should be included in the selection process comprise strategy alignment (Pennypacker and Retna, 2009), resource availability (Pennypacker and Retna, 2009), cost savings or profitability (Meredith and Mantel, 2010, Pennypacker and Retna, 2009), boundary conditions set by the organisation or externally imposed, like legal boundary conditions (Meredith and Mantel, 2010) and risk balance (Reyck et al, 2005).

The selection of projects is not necessarily a one-shot exercise performed at some starting point. On the contrary, various authors plea for considering PPM as a continuous activity, also considering projects that are already on the way. The world is continually changing, meaning that business cases change relative to their environment. As Ter Mors et al (2010) put it, "*The assumptions that were made when the project was started may lose their validity over time, whether expected or not, which may require reprioritizing of projects in the portfolio. Thus, projects need to be periodically assessed in terms of their status and performance. Companies that do not reassess their portfolio of projects on a regular basis disregard possibilities that they may have to reprioritize. That is, they forgo possibilities to abandon unpromising projects and to expand investments in successful projects*".

Archer and Ghasemzadeh (1999) also highlight this idea: "*Project portfolio selection is the periodic activity involved in selecting a portfolio*", as well as Blichfeldt and Eskerod (2008) who include the words "*the concurrent reprioritisation of projects in the portfolio*" in their definition of PPM. Martinsuo and Lethonen (2007) define PPM as "*a dynamic decision process, where a list of active projects is constantly updated and revised*". A method that enables reduction of this one-shot issue is the widely applied stage gate principle in which a project is divided in multiple smaller stages (e.g. initiation, execution, closure) at the end of which it has a 'gate' at which the progress of the project is reviewed. Re-evaluating the position of the project in the portfolio at each stage-gate would reduce the one-shot issue.

#### 2.2.2 Range and scope of PPM

The position PPM process in organizational terms is not the same in every organisation. Besides the individual project managers and a project steering committee per single project, typical functions and/or bodies that exist around PPM are one or multiple Project Management Offices (PMO's), responsible for providing project information, and a committee that makes the project selection and prioritisation decisions (Pennypacker and Retna, 2009). On the basis of empirical findings, Filippov et al (2010) describe variations in the share of PPM in all business operations. PPM may cover only a part of business operations, e.g. with routine operations considered as line activities. It can also occur that

PPM may cover a specific business sector/area within a company, like IT. Finally, a complete overlap is also possible, in which all business activities are done in projects and the functional work may virtually not exist.

Blichfeldt and Eskerod (2008) have found that in practice PPM does not necessarily cover all projects within an organisation or organizational body. Smaller so called 'under-the-radar' projects are frequently not part of the organisation's PPM system. '*PPM often only covers a subset of on-going projects, while projects that are not subject to PPM tie up resources that initially were dedicated to PPM projects*' (Blichfeldt and Eskerod, 2008). This poses a dilemma of on the one hand not wanting to lose track of the smaller projects which are initially not covered by PPM for the sake of good resource management, and on the other hand over-bureaucratisation leading to overhead work and dissatisfaction of employees for losing a part of their freedom of self-controlling their activities. The authors advise to decide first whether or not to include all projects in PPM, and in the not-case to have top-management decide the boundaries for which projects should be in and out of PPM and decide on the amount of resources that are dedicated to the out-of-PPM projects.

### 2.2.3 PPM maturity models

Various frameworks exist for assessing the maturity of Project Management and PPM in organisations, with maturity being roughly described as the state in which the organisation is in a good condition to achieve its business objectives and realise its strategy. Pennypacker and Retna (2009) explain the goal of a maturity model as "*to help an organization assess its level in absolute terms and then develop a roadmap to rise to higher levels*". Common project management maturity models include P3M3 (Portfolio, Programme and Project Management Maturity Model) by UK's OGC, OPM3 (Organizational Project Management Maturity Model) by PMI, CMM/CMMI (Capability Maturity Model /-Integration) by Carnegie Mellon University's Software Engineering Institute, etc.

Using these models, the maturity of Project Management and/or PPM in an organisation is assessed for a number of variables on typically a 5 point scale, ranging between the first awareness of the process and the optimised level. In this scale, the maturity PPM is measured from various perspectives. For example, P3M3 uses seven perspectives, being Management Control, Benefits Management, Financial Management, Stakeholder Engagement, Risk Management, Organizational Governance and Resource Management (OGC, 2010).

Although close, the maturity of PPM is different from PPM Adoption. First of all, PPM maturity considers the current state of affairs, whereas in PPM Adoption the decision of implementation is central, hence the reasons for desiring a particular level of PPM.

### 2.2.4 PPM Success

The link between PPM Success and PPM Adoption has been researched by De Reyck et al (2005), with the return of projects and (inversely) the number of project-related projects as indicators of PPM success. Their conclusion is that "*an increased PPM adoption level has a significant positive impact on the return on the projects in the portfolio and a significant negative impact on the number of project-related problems reported*" (De Reyck et al, 2005). The authors have found that adopting only a few PPM elements can already deliver benefits and that some elements, e.g. PPM software, are more effective when the organisation in its totality is already considerably advanced in PPM.

In a similar fashion, Teller et al (2012) study the effect of both single project formalisation and PPM formalisation on success, mediated by PPM quality. They find that both single project and portfolio formalisation are positively related to PPM quality, which gets even stronger when these two forms of formalisation increase both as well as when project complexity is higher. The authors conclude that "*PPM quality is significantly related to project portfolio success*" (Teller et al, 2012). Altogether this means that increasing formalisation implies higher PPM success. Formalisation is comparable to PPM Adoption (De Reyck et al, 2005).

## 2.3 Innovation and adoption

In this section a deeper look is taken into research on adoption of innovations, the roots of which lay in diffusion research. A selection of the work of these authors is discussed. Although the authors do not explicitly study the innovation of PPM, they do focus on process / organizational innovations. In a number of these works, critical factors are mentioned that are instrumental to our conceptual framework.

### 2.3.1 Innovation

The academic father of diffusion research is Everett M. Rogers. His book 'Diffusion of Innovations' (Rogers, 2003) was first published in 1962, has been cited extensively and reprinted in several editions. In line with Rogers' work, various scholars in the field of diffusion research have independently found that the diffusion of innovation follows an S-shaped curve over time. Well-known

contributions of Rogers comprise the adopter categories (innovators, early adopters, early majority, late majority and laggards) and the innovation-decision process (from knowledge through persuasion, decision and implementation to confirmation). The decision step in the innovation-decision process forms the link to adoption, since the decision can either be rejection or adoption (Rogers, 2003). Rogers' work takes primarily a macro perspective, the perspective of, as Rogers calls it, 'the change agent'. This change agent is the person or organisation that 'brings' rather than 'receives' the innovation and hence Rogers mainly studies aggregate diffusion effects of the innovation.

Traditionally, the term 'innovation' has implied bringing new (physical) objects on the market, embracing new technologies. The contemporary understanding of innovation is much broader. Innovation is understood as the creation of better or more effective products, processes, services, technologies, or ideas that are readily available to markets, governments, and society. This idea is consistent with the way Rogers (2003) defines innovation, as "*an idea, practice, or object that is perceived as new by an individual or other unit of adoption*". Rogers (2003) identified an organizational innovation as a discipline of study. It is anything that is done for the first time in an organisation, and it is part of the organizational change process.

In its Oslo Manual, OECD (2005) defines an organizational innovation as "*the implementation of a new organizational method in the firm's business practices, workplace organisation or external relations*". In other words, innovations in workplace organisation involve the implementation of new methods for distributing responsibilities and decision making among employees for the division of work within and between firm activities (and organizational units), as well as new concepts for the structuring of activities, such as the integration of different business activities. Organizational innovation is driven by three main factors, as behaviour of individuals, internal characteristics (culture) of the organisation, and factors external to the organisation.

As the service (tertiary and quaternary) sector starts to play a critical dominant role in most Western economies, innovation in services, and/or organizational innovation have come to the fore. In this way, we consider PPM as an organizational innovation at the level of particular organisations. This innovative practice is expected to improve the organisation's performance as we have argued in the previous section.

### 2.3.2 Adoption

As opposed to Rogers' macro perspective, studying factors that influence PPM Adoption requires a micro perspective, being that of the individual adopter, in this case the adopter being an organizational body. Various authors have researched innovation adoption from the micro perspective (adopter perspective). Damanpour and Schneider (2006) have studied the influence of various factors on adoption of innovations by approximately 1200 public organisations in the United States, categorising the factors into environmental, organizational and top-manager's characteristics and concluding that each of these dimensions is to a higher or lower extent responsible for unique variances in the adoption of innovation. For example, Damanpour and Schneider (2006) find that the organizational characteristics and top managers' attitudes toward innovation are more powerful than environmental and top managers' demographic characteristics. The influential factors that Damanpour and Schneider (2006) mention comprise 'complexity and size' of the organisation and 'top management's attitude to innovation, which they also refer to as 'change-oriented behaviour'. Wong and Aspinwall (2005) have investigated the critical success factors for adopting one particular innovation, being Knowledge Management (KM). They found 'Management and leadership support' and 'Culture' as the most important factors for KM adoption success.

Teller et al (2012) have studied the influence of formalisation (e.g. adoption) on PPM success, finding that complexity is an important moderating factor. Čudanov and Jaško (2012) have studied the influence of dominant management orientation on ICT adoption and found that organisations in which dominant management orientation was result-oriented had much better and effective ICT adoption.

## 3 Conceptual Framework

This section brings insights from research on PPM, organizational innovation and adoption together to develop a conceptual framework of PPM Adoption. The framework consists of two parts. Firstly, it is the state of PPM Adoption, based on the variables identified in De Reyck et al (2005). Secondly, it specifies the factors – conditions and drivers – that influence PPM Adoption. These factors have been derived from the extant body of academic literature. Additionally, their relevance and validity were supported in a series of explorative interview with management consultants specialised in PPM,

conducted in the course of March-May 2012.

### 3.1 The stages of PPM Adoption

De Reyck et al (2005) have studied the link between PPM Adoption and PPM success. For this, nine variables were developed to measure the degree of PPM advancement. These variables are presented in Table 1. De Reyck et al (2005) suggest using a 4-item Likert scale to measure each of the variables and to express the simple average of the response levels for each of this variables as the 'overall adoption level'.

**Table 1 Variables to measure the degree of PPM Adoption**

Variable	Description
Centralised view	To have an inventory of current and proposed significant projects
Financial analysis	Determining the value of projects using various financial techniques for project selection, like Return on Investment (ROI) and Net Present Value (NPV)
Risk analysis	Management of overall risk analysis of the project portfolio, regarding various types of risks (e.g. technology, cash flow, market)
Interdependencies	Management of interdependencies between projects. Interdependencies comprise overlap in project outcomes, implementation bottlenecks and resource competition.
Constraints at portfolio level	Consideration on portfolio level of constraints in budget, human resource, infrastructure and staff capability
Overall analysis	Management of overall measures of the project portfolio including diversification and risk vs. reward analysis
Categorisation, selection, accountability and governance	Strategy alignment, top management involvement, accountability and governance
Optimisation	Central benefit tracking, target-outcome comparisons, regular revisions of the overall project portfolio
Specialised software	The use of specialised software to manage the portfolio of projects

Source: based on De Reyck et al (2005)

### 3.2 Factors influencing PPM Adoption

Factors influencing PPM Adoption form an under-researched topic in the extant body of literature. In this paper, we formulate these factors on the basis of our literature review, supported by explorative expert interviews. In identifying and describing the factors that are of influence on PPM Adoption, difference has been made between conditions (descriptive factors, factors describing characteristics of the organisation) and drivers (normative factors, factors that describing the actions the organisations seeks to undertake or its needs).

#### 3.2.1 Conditions

- Relative resource scarcity

Relative resource scarcity is the relative lack of resources (human, financial, infrastructural and other) that an organisation has in comparison to the total amount of resources required for performing all the (potential) projects. This factor is at the core of any selection model in PPM. Organisations facing high relative resource scarcity, implement selection models to make rational decisions as to which project proposal to accept and which to decline. If organisations have abundant resources for all project proposals, the need for selection models would not be acute. It is therefore expected that increasing relative resource scarcity will have a positive effect on PPM Adoption.

- Portfolio complexity

Portfolio complexity brings the challenge for maintaining oversight over the portfolio. Complexity consists of multiple components. First of all, it is the sheer number of projects. It is easier to keep track of a few projects, while a higher aggregate budget of many projects increases the need to manage the portfolio centrally. Secondly, project interdependencies increase the need for oversight and complicate the oversight over the portfolio. For example, intermediate outputs of one project may form critical inputs to another on-going project. Thirdly, it is single project uncertainty describing the average extent to which the course and results of a single project are predictable. For example, innovative projects, such as new product development, generally face a relatively high uncertainty in comparison to a

repeated rollout of a small software application. Altogether, Portfolio Complexity is expected to have a positive effect on PPM Adoption, i.e. the more complex the current project portfolio, the higher is the need for PPM Adoption. This factor is mentioned by various authors such as Damanpour and Schneider (2006), Teller et al (2012). On the basis of empirical analysis of several case studies, Filippov et al (2010) have concluded that the main problem leading to introduction of PPM practices was the growing amount and complexity of projects.

As one of the respondents in our research stated, *“If you have to complete 30 projects and you have no structure to achieve it, then you’re just trying to blindly work through whichever one comes up first... for my client they had realised very quickly that that wasn’t going to help them accomplish any real strategic goals”*.

- Organizational culture

The culture of an organisation, involving management culture, is a critical condition of any organizational innovation (Hurley and Hult, 1998). Management culture describes to what extent top management desires to be in control, to what extent top management prefers bureaucratic management over a looser management style. Čudanov and Jaško (2012) use the terms ‘result oriented vs. people oriented’ for this. Wong and Aspinwall (2005) mention leadership as a critical element of managerial culture. A more control/result oriented management culture is expected to positively influence PPM Adoption. Empirics corroborates the theory; as one of the respondents argued, *“It takes more of a strategically focused personality in a manager to push for the adoption of PPM”*.

The ‘change readiness & innovation attitude’ describes the extent to which the organisation is open to the introduction of PPM itself. Introducing an innovation like PPM comes with shifts in power balance and the perception of change in working style, which potentially evokes resistance within the organisation. Commitment and involvement of top managers in PPM (and other stakeholders) are always emphasised in all PM and PPM professional guidelines. In line with it, Jeffery and Leliveld (2004) argue that managers may resist implementation of PPM and it can be viewed as a critical hurdle to PPM, undermining its success. This resistance lays in the potential decrease of managers’ power, which embraces their control over the project budget and resources. PPM Adoption is not only about introducing support project management mechanisms and structures; PPM Adoption may require a culture shift in the organisation. As one of the respondents put it, *“PPM Adoption has a lot to do with the culture of an organisation. (...) Adoption is not just the implementation of the structure to support PPM”*. Overall, change readiness and innovation attitude are expected to show a positive relation to PPM Adoption.

- PPM Gap size

This factor describes the relative effort it would take to adopt and consecutively implement PPM. First of all this lies in the access to knowledge about PPM. This idea is derived from Damanpour and Schneider (2006) who discuss the availability of information for innovation. Organisations that have high exposure to PPM, for example due to their contacts with similar organisations with PPM in place, or knowledge of top managers who used to work with PPM in other organisations, may consider adopting PPM sooner and more pro-actively than those organisations that are not exposed to it much. The factor of top management exposure to innovative practices is discussed by Young et al (2001). Also, the relative ease with which knowledge about PPM is accessible is important too. If an organisation has relatively affordable access to a consultancy company, or it can hire experts with PPM knowledge and experience or has other means for getting access to PPM knowledge, this can contribute to the ease to adopt PPM, and hence bridge this gap.

The other part of this variable is the current state of the organisation. If the organisation has already much in place for what is required for PPM (for example, a formalised Project Management methodology), it would be easier to further adopt PPM. It would make the decision to take up PPM less critical because of its relatively lower impact.

Altogether, the PPM Gap size is expected to have an inverse (i.e. negative) relation to PPM Adoption, i.e. the larger the PPM gap, the less rapid the PPM Adoption will be.

### 3.2.2 Drivers

The section enlists drivers that influence PPM Adoption. By drivers we understand not only factors positively influencing PPM Adoption, but also factors hampering it (negative influence).

- Desire for better information transparency

Top managers may desire to have better information about the project portfolio, in order to be better able to steer it. This factor is derived from the list of potential benefits that PPM brings to

organisations. Levine (2005), Pennypacker and Retna (2009) and others have emphasised that PPM is expected to bring better oversight and better transparent information about the projects in the portfolio. In a study of several cases, Filippov et al (2010) mention that lack of overview leads to frustration on various levels, and hence better transparency is desired.

This factor is expected to have a positive relation to PPM Adoption.

- Need for better predictability of company results

Organisations may experience the need for better predictability of or for more certainty about future results. For example, a stock listed company has the need to predict future profits. Better information about portfolio costs and benefits contributes to this predictability. Thiry and Deguire (2007) mention that predictability is one of the key drivers for implementing a PMO, which can be considered a substantial element in PPM Adoption.

Hence the need for better predictability of company results is expected to have a positive relation to PPM Adoption.

- Desire for project success rate improvement

A widely known fact is that globally most of the projects do not stay within their earmarked budget and planned schedule, leading to higher project costs than intended. Organisations may experience a strong need or desire for improving their project success rates. De Reyck et al (2005) argue that the advancement in PPM Adoption is inversely related to the number of project related problems. In other words, the desire to reduce these problems, alternatively formulated the desire to improve project success rates, is expected to positively influence PPM Adoption.

- Desire for portfolio rationalisation

The desire for portfolio rationalisation is the desire for having fixed criteria for starting and killing projects and to consistently and continuously executing a project selection mechanism. Pennypacker and Retna (2009) mention state that the benefit of PPM is that it should enable to base portfolio decisions on logic, reasoning, and objectivity. This desire is expected to have a positive relation to PPM Adoption.

- Alternative organizational priorities

Alternative organizational priorities mean that top managers perceive other things to be more important to the organisation's performance than PPM Adoption. The adoption of PPM, for example, requires a dedicated budget that may be unavailable in the meantime. The alternative organizational priorities are expected to have a negative relation to PPM Adoption.

### 3.3 The conceptual framework

The previous sections have presented separate elements of the conceptual framework. It is summarised in Figure 1. The framework includes the PPM Adoption spectrum based on the nine variables identified by De Reyck et al (2005) (Section 2.1) and the nine factors potentially influencing PPM Adoption (Section 2.2).

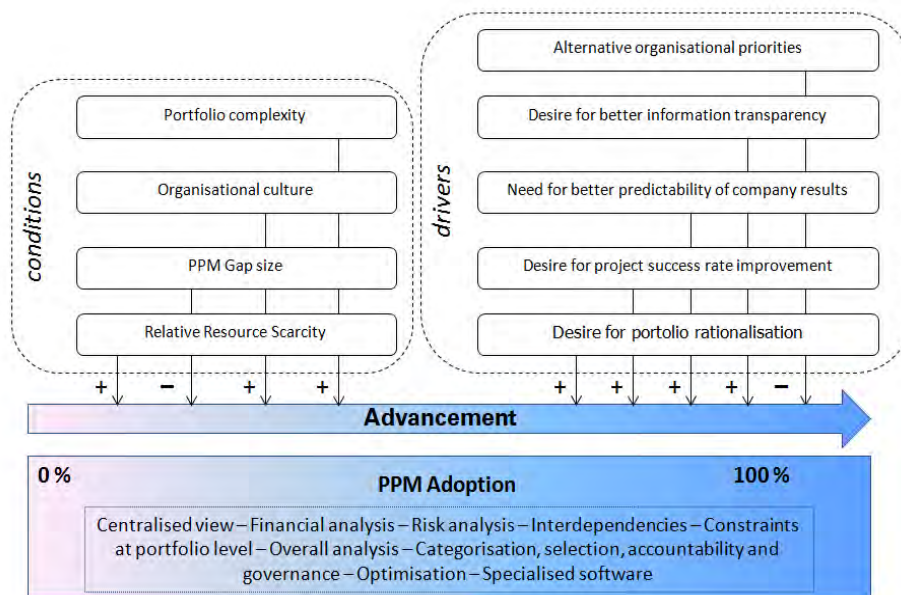


Figure 1 The Conceptual Framework

## 4 Conclusions

Project Portfolio Management has emerged as a distinctive stream of research in the project management discipline. A considerable body of literature (both academic and practitioner-oriented) has been formed, focusing on various aspects of PPM, such as strategic alignment, commitments and human interactions, resource management, etc. Most publications discuss adoption from either a normative or positive perspective. This is either how an ideal PPM should look like, or how PPM works in practice in various organisations. Consequently, research has sought to explain differences between these two perspectives.

A subject in PPM which is largely under-researched is how and under what conditions organisations start and advance their transition towards PPM. The objective of this paper was to contribute to bridging this research gap.

We position PPM Adoption as an organizational innovation that brings about changes to the current practices of organisations. This change can be very profound in project-based organisations. It involves shifting balance of powers and reengineered business practices. Hence the change embraces many organizational aspects, and cannot be limited only to installation of a specialised software as some consultancy companies tend to portray it. It should be noted that there are organizational barriers to innovation and hence PPM Adoption, such as fixed, hierarchical structure, mismatch of people and tasks, unclear goals and objectives, lack of training and no organisation for the management of ideas.

On the basis of literature review and explorative expert interviews we have designed a conceptual framework which can be applied to study the process of PPM Adoption in various organisations. The framework contains nine variables to measure the current state of PPM Adoption as well as nine factors that drive this adoption.

Further research should address the application of this framework in a number of case-studies. As well as using a quantitative approach in a longitudinal study. We can conclude that PPM Adoption is a promising avenue of further academic research.

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## Managing Teams Performing Complex Innovation Projects

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**Abstract:** Complexity of projects is hotly debated and a factor which affects innovativeness of team performance. Much attention in the past is paid to technical complexity and many issues are related to natural and physical sciences. A growing awareness of the importance of socio-organisational issues is announced by researchers and consultants which is much less investigated. The failure of projects may be due partly to overlooking these issues. In this study within a single organization an exploratory framework was developed to research relations between group dynamics (team mindfulness, safety, learning and defensive behaviour, complexity of projects and the outcomes of team performance. Combining data from face-to-face interviews, a survey and a team observation lead to the recommendation that greater attention for group dynamics is beneficial for the output of project teams who are managing and executing complex innovative projects.

**Key words:** Managing innovation; Managing teams; Project management; Soft skills; Project complexity

### 1 Introduction

While a growing number of articles are published on project complexity, many studies have been carried out on the 'hard' technical side, but much less has been investigated on the 'soft' socio-organisational side (Antoniadis, Edum-Fotwe & Thorpe, 2011). 'Hard' project complexity gets most of the attention in studies of large scale construction projects or the application of highly sophisticated new knowledge and technology. 'Soft' project complexity studies put a stronger focus on the human side, for example on issues concerning stakeholders, team dynamics, and leadership. Research conducted by Azim, Gale, Lawlor-Wright, Kirkham, Khan and Alam (2010) indicates that in the perception of project managers the impact on project complexity is largest from people, compared to process and product. According to the authors this implies people not only largely contribute to project complexity, but, consequently, 'soft' skills may also be of more importance than 'hard' skills: hard skills in the context of project management generally refer to processes, procedures, tools and techniques, whereas the soft skills refer to dealing with human issues, i.e. the 'people' part of the project, e.g., communication, teamwork, leadership and conflicts (Azim et al, 2010). What typifies many projects these days are numerous project failures in practice (Thomas & Mengel, 2008). According to several researchers our society as a whole has become an open web of many interacting elements which is changing constantly, and with a fast growing number of interrelationships, while many of us hold on to the dominant project management approach of orderly planning and control which, in spite of that, is no longer suitable to complex projects and project management (Azim, et al, 2010, Baccarini, 1996; Williams, 1999; Pich, Loch & De Meyer, 2002; Jaafari, 2003; Cicmil & Marshall, 2005; Vidal & Marle, 2008; Whitty & Maylor, 2009; Geraldi, Maylor & Williams, 2010; Antoniadis et al, 2011; Gul & Khan, 2011).

This article is concerned with the complexity of innovation projects and asks attention for the 'soft', socio-organisational aspects of project management. Our ambition is to bring together several social-scientific constructs in one study design for the first time and to perform an exploratory analysis on their relationships. The results are meant to better understand some elements of the complexity of project management and to find keys how teams can deal with complex projects (Thomas & Mengel, 2008).

This contribution starts with a description of the organisation studied, which is a large research and technology organization (RTO) in the Netherlands. Subsequently we outline a framework, derived from a literature review. Thereupon the research method – interviews with project managers, a survey among project team members, and a team observation – and results are presented. We end with our conclusion and points of discussion.

## 2 The Case Study Organization and Its Management Challenge

The RTO under study is organized as a project matrix organisation, where the project manager has authority over personnel, finance and other resources (Hobday, 2000) and partly over the content of the project. The project matrix organization crosses functional groupings – here ‘expertise groups’ from natural, technical and social sciences – by projects that align with topics and as such are linked to client segments – here called ‘thematic lines’. Projects may combine expertise from different ‘expertise groups’ and can combine several topics to serve specific client preferences.

The RTO has as purpose to develop innovative and applicable knowledge for the benefit of the economy in general (a quarter of its turnover), while at the same time acquiring commercial orders commissioned by private or public bodies. At the level of projects the RTO promotes larger projects combining several disciplines that could create as much societal impact as possible. In practice, however, most projects are organized within specific disciplines (‘thematic lines’) and within pooled expertise groups, hence reflecting a certain kind of specialized division of labour which may limit the desired impact. The organization unintentionally conveys a paradoxical ‘mixed message’ to its personnel between on the one hand a concern for impact and innovation, and on the other hand for turnover and feasible organizing its projects.

Our study focuses on exploring the management of innovation projects carried out at the level of project teams. These teams consist of scholars from different disciplines selected from either natural science, technical science or social science expertise groups. For these teams and the overall management layer (‘programme management’) steering the projects of these teams is affected by the environment, i.e. the organisational opposing targets, which cannot be completely controlled. However, besides already determining costs, time, scope (‘hard skills’), this overall project management can intervene in the group dynamics (‘soft skills’) of the project teams. The overall project management and the project team members have to deal with the mixed message of being innovative and efficient simultaneously. A risk being unconsciously conducive to avoid complex trajectories that can truly be innovative. The overall project management’s assumed collaboration between project team members being a key variable for both innovative and efficient outcomes. The management problem, therefore, can be formulated as a concern for the proper steering of the projects to reach both these outcomes.

The RTO basically carries out two types of projects, namely innovation projects and routine projects. Innovation projects are characterized by uncertainties such as partly open specifications and unpredictability of results, whereas routine projects are known for their definitive functional specifications and rather concrete wishes from clients. Routine projects are in many cases commercial assignments for which much available knowledge is to be made applicable for specific solutions. Conversely, innovation projects aim to develop new knowledge and new applications, without a distinct client profile or market purpose. The experience of several managers and employees of this RTO is that their innovation projects could be more successful. Although their experience is not representative, the results of these projects are too often not the desired breakthroughs hoped for. The management of one cluster of innovation projects (there are six of such clusters), regarded this situation as a management challenge, and commissioned a research to explore in what way the collaboration among team members of innovation projects could be improved in enhancing truly innovative project outcomes.

The exploratory research has three assumptions which will be expounded. The first assumption is innovation projects are perceived as more complex than routine projects, which differ in obtaining expected results. A second assumption is that the perceived complexity of a project functions as an impetus on humans to stay in control of the situation which subsequently activates defensive behavior. Consequently, defensiveness may function as a counterforce for innovative behavior. The third assumption following from the second is that some kind of unnatural behavior is needed to overcome this defensive behaviour and to make team members aware of their ineffective ways of acting. The research purpose is to explore these three assumptions and investigate if team mindfulness, team psychological safety and team learning behaviour can be helpful to project teams to manage complex innovation projects, thereby overcoming the possible presence of defensive behaviour in teams. A new framework combining several theoretical constructs and methods to measure them needed to be developed.

## 3 Perceived Project Complexity and Team Dynamics: Literature Review

We studied the literature on project complexity and team dynamics to develop a framework how outcomes of team processes are affected. The framework relates four constructs: 1] perceived

complexity of projects, 2] dynamics of groups to deal with complexity (i.e. team mindfulness, team psychological safety and team learning behaviour); 3] one type of dynamics of groups which may interfere with adequately dealing with complexity (i.e. defensive behaviour) and, 4] outputs of project teams (i.e. team innovativeness, team external and internal effectiveness). This framework will result in the research questions and hypotheses.

#### *Project complexity and project management*

In a recent paper Gul and Khan (2011) develop a comprehensive model of project complexity which nicely summarizes the discussion on the topic and consist of three elements: structural complexity, uncertainty and people uncertainty. Structural complexity is founded on the two concepts differentiation and interdependency (Baccarini, 1996). Differentiation refers to the number of varied elements and interdependency to the degree of interrelatedness amongst those elements. Uncertainty refers to the degree to which the two concepts of goals and methods are well-defined (Turner & Cochrane, 1993). Gul and Khan add to this the factor of environmental uncertainty. Williams (1999) combined structural complexity and uncertainty into one model and contended that the former refers to the structure of the project and product, while the latter adds to the complexity of the project. Gul and Khan (2011) extend this model of Williams one step further by adding people uncertainty, which consist of social interactions and rules of interaction. Social interactions refer to relations between people and rules refer to schemas and strategies that, respectively, 'describe or predict others behaviour' and 'suggest to an individual what to do as the game unfolds'.

The extended model combines complexity of structure and people, and describes it in an objectified manner. This study, however, concentrates on how project members perceive complexity. Eventually we want to know how team members deal with complexity as they experience it. While project complexity is related to how complicated it is to arrive at the desired results, and to what extent the process of events can be predicted and managed, Schlindwein and Ison (2005) make a helpful distinction between descriptive complexity and perceived complexity. The first refers to objective, intrinsic properties of a system, while the second considers complexity as subjectively understood through the perception of an observer. Observers in our study are the members of project teams. Project complexity is the way team members experience the complicatedness of their project, therefore, complexity is a property of the project, such as its structural characteristics, uncertainty, dynamics, pace and socio-political characteristics (Gerald et al., 2010). Observers such as team members in this case, may consciously or unconsciously distinguish between their own more distant description of the characteristics of a project and their own experiences of interactions with persons involved. Observers may combine a descriptive view of a project as something 'out there', while at the same time experience being 'in there' as part of the project. Their perceived complexity is a joint property of their distant view and their own experiences, which cannot be separated, because what is out there is what team members experience to a certain extent (Stacey, 2005).

#### *Project complexity and defensive behaviour*

Perceived project complexity implies that executing such projects is difficult and a fallible endeavour, which may invoke feelings of anxiety, skepticism, moral duty and commitment, which are mediated by power relations, and which can be both encouraging and inhibiting (Cicmil & Marshall, 2005). The reasons are mainly of a psychological nature. Humans have a preference for control which makes them feel comfortable. If humans perceive a situation as complicated and as difficult to master they may feel anxiety and are inclined to restore the situation to a state of control. Argyris refers to this kind of behavior as organisational defensive routines, which are any action, policy, or practice that prevents organisational participants from experiencing embarrassment or threat and, at the same time, prevents them from discovering the causes of the embarrassment or threat (Argyris, 2004b: 392). Examples of defensive behavior are shifting responsibility, blaming others, avoiding conflicts, reducing a big problem into a small issue, which prevents feelings of embarrassment, threat and anxiety. This is often the case in complicated situations, such as situations in project teams dealing with complex projects. Complexity is a source for one of the most frequently occurring defenses, namely sending mixed messages. Argyris illustrates how this works: "'Mary, you run the department, but check with Bill', or 'John, be innovative, but careful'. The logic is: (a) send a message that is inconsistent; (b) act as if it is not inconsistent; (c) make steps (a) and (b) undiscussable; and (d) make the undiscussability undiscussable" (Argyris, 2004b: 392). The theory of action helps to explain why humans perform defensive behavior (Argyris, 1990, 2004a, 2004b; Argyris & Schön, 1996). Human beings hold two types of theories of action. The one they espouse is usually expressed in the form of stated beliefs and values (the 'espoused theory'); the other one is their 'theory-in-use' which can only be inferred from

observing their actions, their actual behaviour. In practice this means that human beings craft their positions, evaluations, and attributions in ways that inhibit inquiries into and tests of them with the use of independent logic. Consequently, these strategies are likely to be defensiveness.

*Unnatural behaviour to deal with complexity*

Innovation projects perceived as complex create group dynamics that may trigger defensive routines. Innovation, however, urges for deviation of routine behaviour. Talking about creating new music, avant-garde musician Frank Zappa says: “Without deviation from the norm, progress is not possible” (Zappa, 1989: 185). From the field of risk and crisis management one can learn that unnatural behaviour is helpful to deal with unexpected situations (Weick & Sutcliffe, 2007; Barton & Sutcliffe, 2009; 2010). Natural behaviour refers to theory-in-use actions that help humans to unilaterally control their feelings and thoughts in complex and unexpected events that arouse anxiety and uneasiness. The reason why complexity leads to unexpected events, is that, in project teams and their environments, humans perform multiple responsive interactions at a ‘local’ level that lead to ‘emergent patterns’ that cannot be predicted (Stacey, 2005). ‘To manage the unexpected’ one needs to know how expectations work. Humans tend to except as evidence all that confirms their expectations, and actively seek out such evidence (confirmation bias, Weick & Sutcliffe, 2007: 23-27, 167). High-risk organizations, like nuclear power plants, surgery teams in emergency rooms, crisis management organizations, fire fighting departments, traffic control towers, or aircraft carrier flight decks, train their personnel to counteract confirmation seeking tendencies, by learning to fight their own expectations, and in doing so performing unnatural behaviour. The purpose is to prevent failures and disasters and to limit the escalation of those failures and disasters that occurred nonetheless. These organizations are organizing a ‘mindful infrastructure’ to combat the mechanism of expectations, that make people, for example, preoccupied with ‘weak signals’, resist oversimplification, and be resilient, i.e. being able to maintain or regain from errors, setbacks and disappointments, which allow to continue operational focus. Such mindful organizations become ‘high-reliability’ organizations (Weick & Sutcliffe, 2007: 2-17; 2006: 516; Weick, Sutcliffe & Obstfeld, 1999).

#### **4 Framework to Explore Dynamics in Project Teams and Hypotheses**

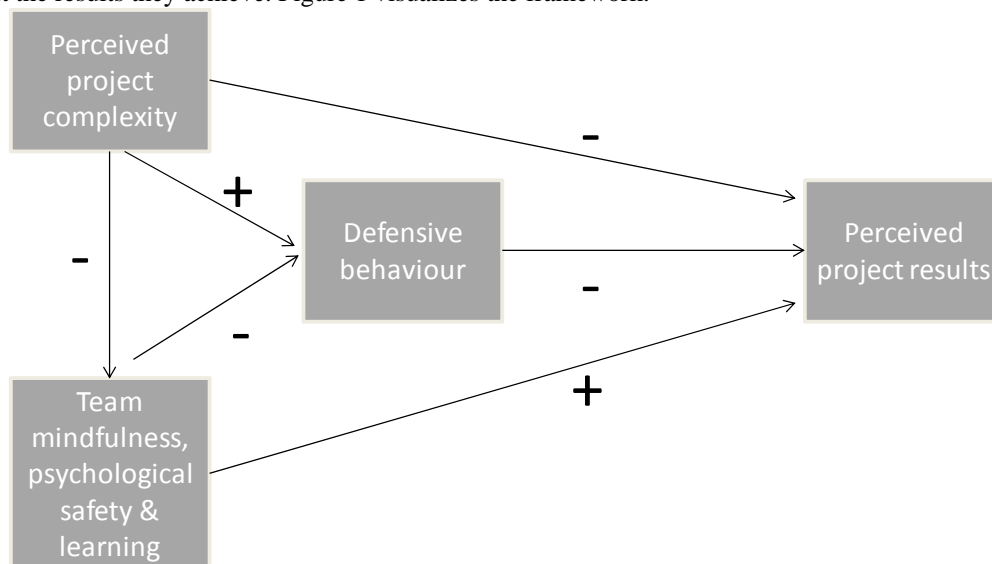
Team mindfulness, team psychological safety and team learning are explored to study whether they have a positive influence on the results of project teams. Team mindfulness is defined as a collectively shared mental orientation toward continuously being alert about unexpected events and what can go wrong in the project. Team mindfulness should help team members to come into action when a project goes off-track. But a team consisting of various individuals may not work as a well coordinated team should. At times when action is needed a team may fail to act, for example due to the fact that the team may not notice weak signals or team members get stuck in their theory-in-use. Instances like these may lead to ‘dysfunctional momentum’, when people continue to work toward an original goal without pausing to recalibrate or re-examine their processes, even in the face of ‘weak signals’ suggesting they should change course (Barton & Sutcliffe, 2009; 2010). Momentum means team members are engaged in a particular course of action, usually aimed at a specific goal, which can become dysfunctional for various reasons, among them seeking for confirmation of expectations. Barton and Sutcliffe point out that their ideas bear relevance to other than high-risk organizations such as business organisations and innovation teams (Barton & Sutcliffe, 2010).

Team mindfulness can lead to voicing concerns, which is a necessary condition for teams to reconsider their actions. Speaking out, however, is not self-evident. Argyris (1990) has pointed to the triggering of organisational defensive routines if voicing concern could imply embarrassment, rejection or punishments from team members, and Janis (1982) pointed out that group cohesiveness and groupthink may reduce the preparedness to stick out deviant views. Therefore, team psychological safety is an important condition to make ‘the undiscussable discussable’, which is defined as a shared belief the team is safe for interpersonal risk taking (Edmondson, 1999). Edmondson holds that team psychological safety is meant to suggest a sense of confidence that the team will not embarrass, reject, or punish someone for speaking up, implying mutual respect and trust among team members as a team climate (1999: 354).

For team mindfulness to become manifest, teams may also have to perform team learning besides team psychological safety. Learning by individuals is inhibited when people face the potential for threat or embarrassment (Argyris, 1990; Barton & Sutcliffe, 2009, 2010), therefore the absence of learning threatens team performance (Edmondson, 1999). Team learning at group level is an ongoing process of

reflection and action, characterized by asking questions, seeking feedback, experimenting, reflecting on results, and discussing errors or unexpected outcomes of actions (Edmondson, 1999). The project teams of the RTO not only consist of team members who come from various locations and positions within the organization, they also bring together different disciplines and backgrounds ('expertise groups' and 'thematic lines'). Team diversity is significant as teams differ in attributes like gender, ethnicity, professional status, educational degree and scientific discipline. Team diversity poses barriers to collaboration in teams, largely to impeding effective communication. "Superficial or ingenuous conversation may soothe in the short run but is likely to block progress in the longer run. This is especially true for teams engaged in innovation and involved in other work activities that call for behavioral and organisational change" (Edmondson & Roloff, 2009: 202).

Our framework reflects the following line of reasoning. Complex projects –perceiving projects as complex, e.g., due to higher degrees of innovativeness – associate negatively with perceived project results. The reason is that project complexity negatively relates to team mindfulness, team psychological safety and team learning. On its turn, team mindfulness, team psychological safety and team learning associate in a negative way with defensive behaviour: the more mindfulness etc., the less defensiveness. And, finally, on its turn, defensive behaviour has a negative relation with perceived project results: the more defensiveness, the lower perceived projects results. Therefore, group dynamics like team mindfulness, team psychological safety and team learning may suppress defensive behaviour, and when it does team members can better cope with complex projects, which leads to a more positive perception about the results they achieve. Figure 1 visualizes the framework.



**Figure 1 Framework of the Study**

The research questions, following from this framework, are: Can mindfulness, safety and learning in project teams enhance the results of project teams?; Does defensive behaviour affect project results?; Are the results of project teams affected by perceived project complexity? This study will explore whether team mindfulness, team psychological safety and team learning together contribute to the performance of project teams of the RTO, i.e., that team members perceive their (expected) project results in a positive way:

*Hypothesis 1 (H1):* Team mindfulness, team psychological safety and team learning are positively associated with perceived project results.

Following Argyris' insights the study investigates the impact of defensive behaviour on perceived project results, which is expected to be negative:

*Hypothesis 2 (H2):* Defensive behaviour is negatively associated with perceived project results.

Innovation projects compared to routine projects may be more confronted with difficulties in good cooperation, effective communication and a shared understanding of the goal of the project. It is plausible that teams whose members report a stronger perceived project complexity may see the project results in a less positive sense. Therefore:

*Hypothesis 3 (H3):* Perceived project complexity is negatively associated with perceived project

results.

It can be suspected that team members reporting high scores on team mindfulness, team psychological safety and team learning show less defensive behaviour. As a consequence defensive behaviour has a weaker effect on perceived project results, because there is a spurious relationship. In this case team mindfulness etc. is a confounding variable that causes defensive behavior being suppressed and perceived project results being positive.

*Hypothesis 4 (H4):* Defensive behaviour is negatively associated with team mindfulness, team psychological safety and team learning.

## 5 Methods

### *Procedure*

The framework presented is meant to eventually argue whether innovation projects and routine projects may differ in their extent of complexity of projects, their group dynamics and their outcomes. We were, however, not able to compare project teams of types of projects during this phase of exploring what constructs and theories may be helpful. We were interested in learning how project team members were perceiving their projects, team dynamics, and outcomes. Therefore we investigated in an exploratory way if the constructs applied make sense in understanding complexity of projects? Subsequently we wished to propose how to improve the collaboration in teams afterwards. For this purpose we studied project team members of various teams, not individual teams or separate types of projects.

To explore the framework via the formulated hypotheses, team members of the RTO are studied using a combination of three methods.

- First, six project managers on innovation projects were interviewed face-to-face with the purpose to make an inventory of their experience with team collaboration and establish if they report problems connected to collaboration in teams. These indicators were used as input for the questionnaire.
- Second, in the project team of one of those six managers a meeting was observed to study possible defensive behaviours. The behaviours were translated into items of the questionnaire.
- Third, a survey (the questionnaire) was held among a sample of team members to explore various relevant constructs. This survey has an exploratory character to investigate associations and directions of correlations which are not much researched until now.

The face-to-face interviews, together with the outlined literature review on teams and innovation, served as background for the design of the questionnaire. The observation of the project team has a special purpose. Argyris and Schön have stressed on several occasions that it is impossible to derive people's espoused theory from interviews: 'When someone is asked how he would behave under certain circumstances, the answer he usually gives is his espoused theory of action (...) However, the theory that actually governs his action, is his theory-in-use, which may or may not be compatible with his espoused theory' (Argyris & Schön, 1974: 6-7; also 1996: 13, 76-77). Especially when researching defensive mechanisms it is unwise to solely rest on surveys or questionnaires, as observations of actual behaviour are regarded as a much more valid method. The observation is meant to collect additional data on defensive behaviour.

### *Survey data*

After testing the questionnaire among a small group of individuals of the same RTO other than the sample, from randomly selected research groups – subgroups within the so-called expertise groups – 379 individuals were approached through the RTOs' intranet and were requested to complete the survey of which 150 responded, a response rate of 40%. Of these 150 surveys, 83 were filled out completely. 36% was working mainly on innovation projects; 58% mainly on routine projects; and 6% on neither of these, which were excluded from the analysis. The relatively low response rate is explained by the desire to test several constructs which made the (exploratory) questionnaire extensive.

As the main purpose of this study was to explore our framework through the hypotheses rather than to describe the properties of particular organisational departments or to compare between teams, the sample was not selected to ensure representativeness of the RTO's population. The level of analysis is the organization as a whole, which implies that all statements made refer to the organisational level, not to individuals or teams.

### *Measures*

Team mindfulness is constructed by adapting the 'organisational mindfulness' scale from Weick and Sutcliffe (2007: 87), which was designed as an audit instrument at the level of an organization to

assess the 'mindful infrastructure'. Moreover, the items were domain-specifically targeted at high-risk organizations which were reworked to be applicable to project team members.

Team psychological safety and team learning behaviour were reproduced from Edmondson (1999) and slightly adapted. Both team psychological safety and team learning behaviour consisted of 7 items each.

Defensive behaviour was measured by reworking 14 defensive strategies investigated by Ardon (2009: 245) based on the theory of Argyris (1990) how unilateral control leads to defensiveness. Ardon arrived at these defensive strategies from using an action research approach, emphasizing narratives and interactions within case studies to try to infer theories-in-use.

Perceived project complexity was inspired on the five aspects of project complexity distinguished by Vidal and Marle (2008: 1097-1098, 1105): size of a project system, variety of the project system, interactions and interdependencies within the system, context and environment dependency of the project system, and, uncertainties and change propagation as consequences of complexity.

Innovation project (1) and routine project (0) formed a dummy variable based on the survey question 'Are you working in an ETP project?' ETP stands for Enabling Technology Project, directed at developing new knowledge and solutions (innovation projects), contrasted by regular projects for customers that resemble routine research projects (routine projects).

The output measures are team innovativeness, external team effectiveness and internal team effectiveness, which are used as indicators for the performance of the project teams with respect to their results. Team innovativeness was measured with a scale constructed by De Dreu and West (2001) consisting of four items derived from Anderson and West (1998).

Perceived external and internal effectiveness respectively reflect the degree to which objectives are met that are associated with external factors, such as budget constraints, overall goals, and interest of clients and stakeholders on the one hand, and the management of team processes on the other hand. The scales are derived from Musallam (2011) who based them on the work of Espirito (2001). The original scales were domain-specifically developed to establish the functioning of nongovernmental organizations, which were made applicable to project team members.

Table 1 presents the Cronbach's alphas for the scales and examples of items, which shows that the internal consistency of all scales are satisfactory with scores of .66 or higher.

**Table 1 Constructs of Independent and Dependent Measures**

Constructs	Examples of items	Cronbach's $\alpha$
Team mindfulness (1=disagree very much to 5=agree very much)	We are very alert to unexpected events and turns in the project' Team members worry constantly about misunderstanding agreements and / or relevant events	.76
Team psychological safety (1=disagree very much to 5=agree very much)	If you make a mistake in this team, it is held against you Team members are able to bring up problems and bottlenecks	.67
Team learning behavior (1=disagree very much to 5=agree very much)	We regularly take time to improve our team's work processes We invite people from outside the team for presentations and / or have discussions with us	.67
Defense mechanisms (1=disagree very much to 4=strongly agree)	That I say 'yes' to a joint decision, in which my real 'commitment' is untrue (compliance strategy) That I participate in attributing causes 'outside the team' or 'to others' once things go against us (blame strategy) That I reduce the problem of seemingly unsolvable issues in order for us to control it (reduction strategy) That I shift responsibility to another person (shirk strategy).	.66
Perceived project complexity (1=disagree very much to 5=agree very much)	This is a very complex project concerning the number of involved team members, stakeholders, financial budget, throughput time, constituent activities and /or decision process This project is characterized by a high degree of uncertainty, for example due to shifting of goals, shifting of interests, changing composition of project team members and / or changing of funding	.74
Team innovativeness (1=disagree very much to 5=agree very much)	Team members apply new ideas to improve the quality of our product / service / knowledge This is a innovative team	.79
External effectiveness	Specific objectives are met within the budget	.83

(1=disagree very much to 5=agree very much)	Team members regard ‘impact’ of the services / products that we provide important	
Internal effectiveness (1=weak to 4= excellent)	Setting clear goals Communication Cooperation within the team	.89

All constructs were recoded to a 1-3 scale

## 6 Results

### *Face-to-face interviews*

From the face-to-face interviews with project managers and project leaders from innovation projects – hence not with representatives from routine projects – an inventory of bottlenecks and encountered difficulties was made, summarized in Table 2. Findings accentuate the events and issues that project managers experience which are complicating the performance of innovation projects. This bias towards negative experiences, underexposing what goes particularly well, was caused by the scope of the research. The project managers mention as (1) structural characteristics that initially project goals are often ill-defined, team composition is diverse and that this can be based on questionable criteria, which enhance the project complexity. With regard to (2) the group dynamics in teams the respondents mentioned that communication between team members is friendly and never confrontational, yet they are very well aware that everyone has their own agenda and possible competing interests. Project managers indicate that communication is sometimes difficult as team members work in several other projects simultaneously, are hard to bring together, and are working at different geographical locations. Project managers also point to a number of (3) external factors such as the management style of higher management and the organisational culture that is creating dilemma’s between business goals and innovation goals. That these bottlenecks contribute to the project complexity in terms of high cognitive demands to manage the project is easy to imagine. What may be less obvious is that the mentioned factors may contribute to role ambiguity, conflicts of interest and less effective cooperation among team members, as they may evoke groupthink and confirmation bias (Janis, 1982) and shadow organizing (Shaw, 1997) instead of enhancing commitment, innovation and creativity. The dilemma between business goals and innovation goals is an overt example of a mixed message, i.e., project complexity which can provoke defensive behaviour. Therefore it is important to mention that the respondents do never speak in these terms. In explaining why processes in their teams do not always go according to their wish, they tend to either attribute causes to external factors or tend to identify the mentioned structural and behavioural characteristics.

**Table 2 Highlights from face-To-Face Interviews with Project Leaders / Managers about Bottle-Necks and Risks in Carrying out Innovation Projects**

	Elements enhancing complexity (from the interviews)	Occasion for mixed messages (the researchers analysis of possible consequences)
(1) Structure characteristics	<ul style="list-style-type: none"> <li>- project definitions and project goals are abstract, general and partly undefined from the outset; regularly the composer of an initial project plan that is approved of for financing is not the same person as the eventual project manager;</li> <li>- a purpose to stimulate innovation is to compose teams consisting of members from diverse backgrounds of disciplines;</li> <li>-the composition of project teams is a matter of having expertise groups being represented, rather than selecting the best person available.</li> </ul>	<ul style="list-style-type: none"> <li>- expectations of the project manager, stakeholders and team members need to be clarified and need to be fine-tuned which is a process that is time consuming, and demanding great meticulousness and involves many individuals;</li> <li>- diversity in disciplines means incorporating differences in expertise, professional languages and a variety of standards and norms (paradigms) and demands clear role structures and tasks and fine-tuning the added value of all team members in each other’s directions; it also demands fine-tuning of interests from stakeholders behind the scene and with departments of the RTO who are delivering manpower and investments implying the use of influence and power;</li> <li>- the project manager sometimes has very limited influence to compose a team according to his/her needs and wishes and has to address preferences from all kind of stakeholders; a project manager is a ‘broker’ in interests, which may lead to a division of a larger project in smaller parcels (addressing more needs but losing focus).</li> </ul> <p>All these factors may contribute to role ambiguity, conflict and less effective cooperation.</p>
(2) Group dynamics in teams	<ul style="list-style-type: none"> <li>- team members are considerate of each other, avoiding conflicts, inclined towards consensus and conforming with commissioners; at the</li> </ul>	<ul style="list-style-type: none"> <li>- communication within teams is not always transparent and may be experienced as possibly unsafe resulting in ineffective and insufficient modes of exchanging views,</li> </ul>





behavior																	
4. 4.Defence: Non-committance	1,92	,961	102	-,136	,094	-,237*	1										
5. 5.Defence: External attribution	1,55	,839	98	-,267*	-,115	-,168	,014	1									
6. Defence: Reduce problems	2,05	,917	97	,092	,198	,155	-,009	,096	1								
7. Defence: Shift responsibility	1,73	,863	100	-,216*	-,007	-,190	,219*	,378**	,146	1							
8. Perceived project complexity	2,26	,817	107	,037	-,038	,244*	-,012	,261**	,217*	-,057	1						
9. Innovation Project	,36	,482	144	-,280**	,046	,000	,214*	,184	,205*	,238*	,205*	1					
10. Team innovativeness	2,29	,819	83	,435**	,457**	,545**	-,064	-,057	,171	-,329**	,176	-,068	1				
11 External effectiveness	2,37	,711	83	,313**	,092	,292**	,031	-,147	,072	-,224*	-,038	-,174	,420**	1			
12.Internal effectiveness	1,99	,529	83	,490**	,496**	,512**	-,003	-,214	,152	-,088	,007	-,217*	,486**	,304**	1		

\* p< .05: \*\* p< .01 (2-tailed)

The framework of our argumentation, unfolded in the hypotheses, was investigated using hierarchical regression analysis, excluding missing values pairwise, on three dependent variables team innovativeness, team internal effectiveness and team external effectiveness. In the first step team mindfulness, team psychological safety and team learning behaviour were entered; in step two four behavioural defence items were entered; and in the third step innovation project and perceived project complexity were entered. The same analysis was performed with entering control variables at the first step (gender, education and average team size), but these had no significant relationship with team innovativeness,  $F(3,75)=1.08$ ,  $p < .36$ . Results of the regression analyses without these control variables are summarized in Table 4.

The main effects – team mindfulness, team internal effectiveness and team external effectiveness – explained a significant and large amount of variance in team innovativeness,  $R^2 = .44$ ,  $F(3, 75) = 19.45$ ,  $p < .01$ , and team internal effectiveness,  $R^2 = .47$ ,  $F(3, 75) = 22.09$ ,  $p < .01$ , and a moderate amount (between small and medium according to Cohen, 1992) of variance in team external effectiveness,  $R^2 = .14$ ,  $F(3, 75) = 3.97$ ,  $p < .05$ . Entering the defensive behaviour variables in step 2 nor the project features in step 3 had much influence on the explained variance. Only the model with team innovativeness gains a very small effect from the defence mechanisms ‘external attribution’ and ‘shift responsibility’, adjusted  $R^2 = .09$ ,  $F(4, 71) = 3.48$ ,  $p < .05$ .

These findings are consistent with the hypothesis (H1) that team innovativeness, team internal effectiveness and team external effectiveness contribute to project results in a positive way. The main effects remain robust and clear in explaining team innovativeness and team internal effectiveness, but not in explaining team external effectiveness. The hypothesis (H2) that defensive behaviour has a negative effect on project results is not fully confirmed. The third hypothesis (H3) stating that complexity in the form of perceiving the project as complex or working on an innovation project is negatively associated with project results has to be rejected. Although the model explaining team internal effectiveness reports a significant standardized beta of innovation project in the expected direction,  $\beta = -.20$ ,  $p < .05$ , supporting the proposed line of reasoning. The fourth hypothesis (H4), namely defensive behaviour is negatively associated with team mindfulness, team psychological safety and team learning, is supported by the significant correlations (Table 3).

**Table 4 Hierarchical Regression Analysis**

	Team Innovativeness	Team external effectiveness	Team internal effectiveness
Variables	$\beta$	$\beta$	$\beta$
Step 1 (constant)			
1.Team mindfulness	,239*	,246*	,307**
2.Team psychological safety	,373**	,216	,302**
6. 3.Team learning behavior	,286**	-,033	,330**

Step 2 (constant)			
1.Team mindfulness	,237*	,228	,308**
2.Team psychological safety	,360**	,227	,324**
3.Team learning behavior	,291**	-,059	,307**
4.Defence: Non-committance	,094	,161	,078
5.Defence: External attribution	,214*	,005	-,062
6. Defence: Reduce problems	,062	,054	,012
7. Defence: Shift responsibility	-,318**	-,177	,047
Step 3 (constant)			
1.Team mindfulness	,233*	,198	,253*
2.Team psychological safety	,359**	,286*	,363**
3.Team learning behavior	,293**	-,076	,306**
4.Defence: Non-committance	,096	,198	,118
5.Defence: External attribution	,212*	,062	-,035
6. Defence: Reduce problems	,064	,102	,056
7. Defence: Shift responsibility	-,315**	-,190	,062
8.Innovation Project	-,016	-,115	-,198*
9.Perceived project complexity	,008	-,141	-,037
Model 1:R <sup>2</sup>	,44**	,14*	,47**
Model 2:ΔR <sup>2</sup>	,09*	,04	,01
Model 3:ΔR <sup>2</sup>	,00	,03	,03
F(3, 75)	1.,45	3.97	22.09
N= 83 (min.), 144 (max.)			
*p< .05; **p<.01			

### *Team observation*

Following the guidelines of Argyris & Schön (1974; 1996) defensive behaviour was additionally studied by observing a meeting of one of the project teams, consisting of six participants, which was videotaped (90 minutes were recorded). The meeting was one of the teams' regular meetings to discuss the progress of the project and exchange views, information and experiences. The atmosphere was constructive and friendly and participants told afterwards that they felt it was a good meeting and that substantial progress was made. It proved to be difficult to detect defensive behaviour during the meeting. This may stress how subtle defensive behaviour is performed and how unaware humans normally are when it is performed – skilled incompetence in Argyris' words. The friendly atmosphere probably contributed to this, as feelings of embarrassment or threat, which are conditional to observe defensive behaviours, may not have been stimulated strongly (Argyris & Schön, 1996: 77).

From the fourteen defensive strategies that were identified by Ardon (2009: 245) the following seven could be observed: (1) compliance strategy: if your superior persuades you to commit, say that you comply regardless of whether you really do; (2) plan strategy: agree to make a plan and act as if you comply with the plan; this way you contribute to change and stay in your comfort zone; (3) reduction strategy: if things become threatening or embarrassing, reduce the problem until it is controllable again; (4) distance strategy: if the discussion comes too close, change the subject to discuss 'other' parties or general observations, such as employees, middle management, or 'the organization'; (5) 'we' strategy: talk in terms of 'our responsibility' and 'what we should do'; as a consequence, nobody has to feel personally responsible; (6) joke strategy: if things become threatening or embarrassing, make a joke and change the subject; (7) shirk strategy: shift the responsibility to an 'outsider' and avoid sharing your own opinion about the process or colleagues. To illustrate these findings, Table 5 presents some slightly edited and shortened excerpts of the discussion that were taken from the meeting.

**Table 5 Excerpts from the meeting of the project team managing an innovation project**

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**Compliance strategy**  
 Team members discuss a proposal of higher management to enhance the knowledge position in a coherent way that is to have 'impact' in a practical sense, which seems to be in conflict with their own interests to realize stronger scientific embeddedness within universities.  
 TM 1 "I feel this leads to a mismatch with our relation with universities"  
 TM 2 "You may be right, but it depends on how we explain things. If we do *more* than we have to, it could fit in well just as easily"  
 TM 1 "You mean, as long as it contribute to the value of the themes (for higher management) we are working on? Okay. That would work well for us"  
 TM 3 "Yes, let's just do both".

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**Reduction strategy**  
 Team members are discussing the target to produce the number of scientific articles. The norm that they discuss is that for each €100.000,- that is invested into the project at least one scientific article should be published.  
 TM 1 "Dissemination is an important issue. How do we proceed?"  
 TM 2 Trying to laugh it off: "It is not necessary to have peer reviewed articles since our reading audience are mainly politicians"  
 TM 1 "I see what you mean. If we quantify the output it is easier to reach our targets"  
 TM 2 "Exactly"

---

**Plan strategy and we strategy**  
 The project manager mentions four points of attention that the team should decide upon by choosing the direction how to go forward.  
 PM "These points of attentions ask where will be our focus, what will we contribute and what is the role of cases that we study?"  
 TM 1 "I certainly agree we need to talk about this"  
 PM "We need to be more plain in what we will do..."  
 TM 2 "Well I feel that there are more topics than you mention" and mentions several other issues that demand a decision  
 TM 3 "My opinion is we need to know more about those first"  
 TM 1 "Good idea....do we know enough of the details"  
 TM 3 "We can't know it all, can we?"  
 TM 4 "no..no... not yet.."  
 TM 1 "Let's discuss this at the next meeting, ok"  
 PM reluctantly "Okay. I will put it again on the agenda. In the mean time we have to inform each other on all topics so we can quickly take decisions"

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TM=team member; PM= project manager

## 7 Conclusion and Discussion

The results of the study clearly show that team mindfulness, team psychological safety and team learning behaviour contribute to positive outcomes of project teams (H1) and that these factors associate with decreased defensive behaviour (H4). The role of defensive behaviour provides an inconsistent picture. On the one hand it could be observed that the defence mechanisms external attribution and shift responsibility had only small negative effects on project results, but non-committance and reducing problems had no effect on the other hand (H2). With respect to innovation project and project complexity the expected negative effects on project results did not clearly emerge in the survey-data (H3). This does, however, not lead to the conclusion that defensive behaviour nor project complexity and the innovative character of projects are no points of concern for project results. The face-to-face interviews and the video-observation of the meeting gave clear indications that project complexity can lead to mixed messages and that defensive behaviour is quite subtle and difficult to detect. Such 'weak signals' are easily misinterpreted by the members of the teams and may negatively influence the realization of innovative results in project teams without realizing this. The interviews and video-observation put the survey-data in a broader perspective.

The examples of experienced bottlenecks and risks by the interviewed project managers and the video-excerpts illustrate complex interrelating of people on the one hand and non-confronting behaviour to not upset others on the other hand. 'Local interactions' form 'global patterns' of behaviour; patterns which are constituted by humans, and humans are at the same time constituted by this patterning. This 'complex responsive processes' of 'interaction between human bodies' is ongoing and unpredictable, and as such never completely controllable by any individual, even if individuals behave intentional and even if some individuals have power over others (Stacey, Griffin & Shaw, 2001: 188; Griffin, Shaw & Stacey, 1998, 1999; Shaw, 1997; Stacey, 2005, 2007). The complexity perspective becomes manifest in the fact that there is no mono-causality in the way people influence each other in their day-to-day practice of communicating. Individuals interact with several intentions, but when threats of embarrassment, anxiety of unsafety may inhibit being either vulnerable or confrontational, there very seldom is an open communication where everything is said that needs to be told and where thoughts are

spoken out frankly. Because people ease in and process thoughts individually, managing processes in project teams gets complicated; it is impossible to completely control what emerges and how team members think and experience what is going on. Moreover, human acts and experiences are partly based on unconscious processes, further complicating managing such processes. Defensive behaviour is lurking in such team dynamics.

There are a possible number of reasons why not all expected relations were not found in the survey-data.

First, the number of respondents is limited as only 83 from the 150 respondents completed all the questions of the questionnaire.

Second, concerning defensive behaviour, respondents may be inclined to give social desirable answers, hence the survey-data may be an underestimation of the real phenomenon. On the other hand, the answering pattern could be viewed as the ultimate affirmation of the presence of defensive behaviour. Defensive behaviour may be unsuitable to be researched through a survey because the underlying psychological process is hard to operationalize and measure with survey items (Argyris & Schön, 1974; 1996).

Third, the variable innovation project, although associated with project complexity in the expected direction, did not have strong and significant correlations with project outcomes and team mindfulness and team psychological safety. Respondents in innovation projects and routine projects experience their project both as rather complex and do not discriminate strongly (means were respectively 2.47 and 2.13 on a recoded 3-point scale; Chi square test was not significant). Relevant to mention is that the programme under which the innovation projects reside was under way for only 10 months at the time of measuring. Maybe it was too early to expect salient results.

Besides the limited number of respondents, which ask for replication among larger samples, two more limitations of the survey should be mentioned. Firstly, the research assumed causal directions but in a cross-sectional survey directions of causality may be in different directions as expected or as found. In the second place, several measures are based on the perception of respondents, like the project results, which can be biased. With a shortened questionnaire and a time frame in which results of innovation projects may be expected, a quantitative follow-up study solve these limitations.

The present results also ask for a follow-up study of a qualitative nature into the mechanisms of defensive behaviour and the characteristics of experiences with project complexity within project teams dealing with innovative goals as targets. One way of doing so is by a (already planned follow-up) research to study the explorative framework in different organizations with project teams working on innovation projects, and investigate how these deal with failures and success, thereby using conjoint analysis and compare cases.

The practical implications of the findings for project management and project teams are that team mindfulness, team psychological safety and team learning behaviour are of importance to improve project results. Some informants of the RTO under study were of the opinion the innovation projects could be more successful by improving the collaboration within teams. This assumption seems to be valid, and may even gain importance if we compare the mean of team innovativeness with other studies. The mean of the RTO was 3.41 versus 3.81, 3.71 and 4.29 (on a 5-point scale; please note Table 3 gives a recoded score of a 3-point scale) reported for the team innovativeness of a private company involved in recruitment, selection and assessment, based on the response by the team supervisors of teams (respectively De Dreu & West, 2001; De Dreu, 2002; 2006 ). Despite the disputability to compare between these figures, due to difference in type of organization and respondents, the RTO's score is relatively low, which may be worrisome for an organization whose most important task is to innovate.

Project teams with innovation as a target, need to be able to successfully explore deviant behaviour. For that purpose they should not be mindless, they should feel safe to undertake risks and they should be facilitated in learning. It is assumed that overcoming defensive behaviour should contribute to being mindful, feel safe and to learn. Project complexity is associated with the presence of mixed messages, paradoxes and dilemma's which make it difficult for project teams to operate effectively. Team mindfulness, team psychological safety, team learning behaviour, and possible also overcoming defensive behaviour, is helpful to better deal with project complexity. The field of innovation in organizations may benefit from the field of safety and crisis management to make its team members more alert and resilient in managing and organizing the unexpected. One recommendation is to develop an intervention to enhance the competences of teams in this manner and test the results. With regard to resilience a recent study supports the idea that innovator resilience potential may strengthen the innovative capabilities of project members after experiencing a setback such as project failure

(Moenkemeyer, Hoegl & Weiss, 2012).

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# Research on the Identification of Listed Companies' Financial Reporting Fraud: Based on Financial and Nonfinancial Information Perspective

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**Abstract:** With the continuous development of Chinese capital market, how to identify and govern listed companies' financial reporting fraud effectively has gained much public concern in the community. Based on the information from the fraud actors, this study introduces the corporate governance perspective to explore the identification model of the listed companies' financial reporting fraud. The result of the empirical analysis presents that fraud companies have more abnormal changes in financial indicators and companies with weak internal governance are more likely to commit financial reporting fraud. Overall, our results provide empirical evidence suggesting that the model based on financial and nonfinancial information can be effectively used to assess the likelihood of fraud.

**Key words:** Financial reporting fraud; Financial indicators; Nonfinancial indicators; Multiple linear regression model

## 1 Introduction

Listed companies financial reporting fraud is not uncommon in the capital markets of countries around the world, and it has intensified along with the economic development. The financial reports of listed companies engaged in corrupt conduct a serious beat on the confidence of the majority of investors, restrict the development of national economies and destroy the effectiveness of capital market. Therefore, identifying, preventing, and governing listed companies' financial reporting fraud has always been a heated topic in the theoretical and pragmatic circles.

The existing literature on listed companies' financial reporting fraud can be summarized in three aspects. Firstly, concerning researches on the identification of financial reporting fraud, a significant and positive correlation between frauds and the quality of management exists in corrupt firms (Albrecht1986). Secondly, With regard to researches on the identification method of listed companies' financial reporting fraud, using the logistic method can find significant differences in the scale of independent directors, serving time of outside directors, shareholding proportion of board and other features (Beasley 1996).Thirdly, through studies on the identification of nonfinancial indicators, customer satisfaction and future business has a significant positive correlation (Ittner and Larcker 1998).

After a brief review of existing literature, we found the following questions: Chinese listed companies fraud motivation and economic consequences still need further summary and analysis to ensure that regulatory measures can be effectively implemented; additionally, as studies on the methods of fraud identification of listed companies is limited, thus we will do further study to improve these problems.

This paper is organized as follows. Section II develops our hypotheses and models. Section III analyse the data by Empirical tests and provides the results. Section IV conclude this paper .

## 2 Development of Hypotheses and Model

### 2.1 Hypotheses

#### 2.1.1 Financial indicators transactions and financial reporting fraud

Financial reporting frauds are mainly in two forms: inflated assets and inflated profits. Based on fraud financial reporting of listed companies in the China Securities Regulatory Commission, 2002-2006 penalty notice, there are significant differences in fraud and normal company's financial indicators, such as high debt ratio, low quick ratio, and high-receivables ratio (Beaseley 1996). Therefore, we put forward the first hypothesis:

Hypothesis1: In terms of the changes in financial indicators, corrupt companies are more significant than non-fraud companies.

#### 2.1.2 Corporate governance and financial reporting fraud

According to the theory of corporate governance, good corporate governance mechanism depends on the effective combination of the internal mechanisms and external mechanisms and so on. The fundamental causes of the listed companies' financial reporting fraud are the imbalance of shareholding



structure, the failure of Board mechanism, the management mechanism corruption and external governance defects and other internal governance factors.

Hypothesis2: The weaker corporate governance exists, the greater likelihood of financial reporting fraud.

## 2.2 Study design

### 2.2.1 Sample selection

#### 1) Fraud samples of listed companies

We identify fraud sample from Xenophon database and the sample is the company punished by China Securities Regulatory Commission for its violation in the period 2006 to 2009. we exclude firms from our sample for the three following reasons: firms with punishment for interim report fraud; firms that manipulate listed market; listed companies in finance and insurance industry; Listed companies with missing key data. Since companies continuously engaged in corrupt conduct, we choose the first fraud year as a fraud sample to prevent the likelihood of the overestimation of fraud. Finally we get 89 fraud samples:

#### 2) Paired samples of non- fraud listed companies

For each matched-pair, we refer to findings of previous scholars that select companies which have similar assets scale in the same industry to make little difference in financial position within a certain time. We identified non-fraud sample for the three following reasons: company that is in the same industry with the fraud sample(referring to guidelines "listed companies in the industry classification guidelines" published by SFC in April 2001); company with most similar asset scale to fraud listed companies prior to the initial fraud year; company that has never been punished. A total of 89 fraud companies selected on the basis of the above methods. Regarding fraud annual report as a sample, there are 89 samples, 89 paired samples, 178 overall samples.

### 2.2.2 Variable definition

**Table 1 Variables and Description of Financial Indicators**

Criterion	Indicator	Indicator description	
Profitability $X_1$	$X_{11}$	Return On Assets	Net Income / Average Total Assets
	$X_{12}$	Return On Sales	Net Income / Operating Income
	$X_{13}$	Return On Equity	Net profit / Stockholders' Equity
	$X_{14}$	Degree of Financial Leverage	(Total Profit + Financial Expenses)/ Total Profit
Solvency $X_2$	$X_{21}$	Current Ratio	Current Assets / Current Liabilities
	$X_{22}$	Quick Ratio	(Current Assets - Inventory) / Current Liabilities
	$X_{23}$	Debt Asset Ratio	Total Liabilities / Total Assets
	$X_{24}$	Equity Ratio	Total Liabilities / Total Owner Equity
Asset Quality $X_3$	$X_{31}$	Inventory Turnover	Operating Expenses / Average Inventory
	$X_{32}$	Asset Turnover	Net sales /Average Asset
	$X_{33}$	Current Asset Turnover	Net sales/Average Current Asset
	$X_{34}$	Accounts Receivable Turnover	Net sales/Average Accounts Receivable

#### 1) Explained variables

Regard whether corrupt conduct exist in financial statement as explanatory variables. The variable set equal to 1 if the firm commit the financial report fraud and 0 otherwise.

#### 2) Financial Indicators explanatory variables

Referring to the research results at home and abroad, we select the samples' change rate of the financial indicators that is in that year and previous year. From three aspects of profitability, solvency, asset quality, we select 12 financial indexes variables (Table1).

#### 3) Nonfinancial indicators explanatory variables

According to the provisions of the OECD corporate governance guidelines and dual structure of the corporate governance, we select nonfinancial indicators from the general meeting of shareholders mechanism, board governance mechanism, Supervisory Committee governance mechanism. According to the agency conflicts under the corporate governance theory, we select nonfinancial indicators defined as follows (Table 2(1), 2(2)):

**Table 2 Variables and description of non financial indicators**

Criterion	Indicators		Indicators description
general meeting of shareholders Y <sub>1</sub>	Y <sub>11</sub>	attendance at annual Shareholders' Meeting	attendance at the Shareholders' Meeting
	Y <sub>12</sub>	number of annual Shareholders' Meeting	total number of annual Shareholders' Meeting
board governance mechanism Y <sub>2</sub>	Y <sub>21</sub>	number of the board of Directors meetings during the year	number of Board of Directors meetings during the year
	Y <sub>22</sub>	chairman change	an indicator variable coded 1 if the firm changed Chairman and 0 otherwise.
	Y <sub>23</sub>	size of the board of directors	total number of directors
	Y <sub>24</sub>	Independent Directors on the board	the percentage of independent directors on the board
	Y <sub>25</sub>	CEO=COB	an indicator variable coded 1 if the firm's CEO was also Chairman of the Board and 0 otherwise.
	Y <sub>26</sub>	Audit Committee building	an indicator variable coded 1 if the firm sets audit committee and 0 otherwise.
Supervisory Committee governance mechanism Y <sub>3</sub>	Y <sub>31</sub>	number of the board of supervisors meetings within the year	number of the board of supervisors meetings within the year
	Y <sub>32</sub>	the scale of the board of supervisors	number of the Board of Supervisors
	Y <sub>33</sub>	change in chairman of the Supervisory Board	An indicator variable coded 1 if the firm changed Chairman of the Supervisory Board and 0 otherwise.
proportion of insider ownership Y <sub>4</sub>	Y <sub>41</sub>	Directors' Shareholding on stock	the percentage of Directors' Shareholding on stock
	Y <sub>42</sub>	Supervisors' Shareholding on stock	the percentage of Supervisors' Shareholding on stock
	Y <sub>43</sub>	Executives' Shareholding on stock	the percentage of Executives' Shareholding on stock
salary system Y <sub>5</sub>	Y <sub>51</sub>	The top three Directors' annual salary	In(sum of the annual salary of the top highest remuneration of the directors)
	Y <sub>52</sub>	The top three Executives' annual salary	In(sum of the annual salary of the top three remuneration of executives) Note: exclude directors, supervisors
ownership concentration Y <sub>6</sub>	Y <sub>61</sub>	largest shareholders on stock	The percentage of largest shareholding on stock
	Y <sub>62</sub>	Z index	percentage of the largest shareholders/ percentage of the second-largest shareholder
	Y <sub>63</sub>	Herfindahl_5 index	sum of squares of former five Directors' Shareholding proportion
	Y <sub>64</sub>	Herfindahl_10 index	sum of squares of former Directors' Shareholding proportion

2.2.3 Model design

Because the selected explanatory variables Fraud is a qualitative variable, it is only through logistic regression analysis. Use logistic regression to analyse and test the fraud mode, Model as follows:

$$fraud = \ln \frac{1 - p}{p} = \mu_1 X_{1i} + \mu_2 X_{2i} + \mu_3 X_{3i} + \mu_4 X_{4i} + \varepsilon_1 \tag{1}$$

$$fraud = \ln \frac{1 - p}{p} = \eta_1 Y_{1i} + \eta_2 Y_{2i} + \dots + \eta_6 Y_{6i} + \varepsilon_2 \tag{2}$$

$$fraud = \ln \frac{1 - p}{p} = \alpha_{mi} X_{mi} + \beta_{ni} Y_{ni} + \varepsilon_3 \tag{3}$$

Note, P: the probability of no fraud to listed company; X<sub>mi</sub>: financial indicator variables having a significant impact on listed companies' financial reporting fraud; Y<sub>ni</sub>: nonfinancial

indicator variables having a significant impact on listed companies' financial reporting fraud;  $\alpha_{mi}$ 、 $\beta_{mi}$ : Coefficient;  $\varepsilon_3$ : Random error.

### 3 Data Analysis

#### 3.1 Significance test

##### 3.1.1 Significant test on the financial indicators

**Table3 Significant Test on the Financial Indicators and Nonfinancial Indicators**

Indicator	Asymp.Sig. (2-tailed)	Indicator	Asymp.Sig. (2-tailed)
X <sub>11</sub>	0.043790921	Y <sub>11</sub>	0.6281136
		Y <sub>12</sub>	0.0704798
X <sub>12</sub>	0.206733321	Y <sub>21</sub>	0.5063805
		*Y <sub>22</sub>	0.0255545
X <sub>13</sub>	0.193457705	Y <sub>23</sub>	0.5403702
		*Y <sub>24</sub>	0.0024884
X <sub>14</sub>	0.196462215	Y <sub>25</sub>	0.1565567
		Y <sub>26</sub>	0.2821171
*X <sub>21</sub>	0.078393242	Y <sub>31</sub>	0.2465475
		Y <sub>32</sub>	0.3517504
*X <sub>22</sub>	0.010507744	Y <sub>33</sub>	0.0001016
		Y <sub>41</sub>	0.0221515
X <sub>23</sub>	0.014244962	Y <sub>42</sub>	0.317355
		*Y <sub>43</sub>	0.0310819
X <sub>24</sub>	0.059602956	Y <sub>51</sub>	0.2352371
		*Y <sub>52</sub>	0.087689
X <sub>31</sub>	0.298317089	Y <sub>61</sub>	0.4245346
*X <sub>32</sub>	0.039843409	Y <sub>62</sub>	0.3648203
X <sub>33</sub>	0.06858115	Y <sub>63</sub>	0.5874281
X <sub>34</sub>	0.363280253	Y <sub>64</sub>	0.5854262

According to the fraud samples' financial indicators that are in that year and previous year, we calculate the change rate of financial indicators and conduct significant test. Test results are shown in Table 3. In the 0.1 significance level are Return On Assets (X<sub>11</sub>), Current Ratio (X<sub>21</sub>), Quick Ratio (X<sub>22</sub>), Debt Asset Ratio(X<sub>23</sub>), Quito Ratio(X<sub>24</sub>), Asset Turnover (X<sub>32</sub>) and Current Asset Turnover (X<sub>33</sub>). These seven indicators have a significant impact on financial reporting fraud.

##### 3.1.2 Significant test on the nonfinancial indicators

Table 3 also lists the significant test results of nonfinancial indicators. In the 0.1 significance level are the number of annual Shareholders' Meeting (Y<sub>12</sub>), Chairman change(Y<sub>22</sub>), Independent directors on the board (Y<sub>24</sub>), CEO=COB (Y<sub>25</sub>), Change in Chairman of the Supervisory Board (Y<sub>33</sub>), Directors' Shareholding on stock (Y<sub>41</sub>), Executives' Shareholding on stock (Y<sub>43</sub>), executives' salary(Y<sub>52</sub>) and largest shareholders on stock(Y<sub>61</sub>). These nine indicators have a significant impact on financial reporting fraud.

### 3.2 Regression analysis

#### 3.2.1 Regression analysis based on fraud recognition model of financial indicators

Table 4 includes financial reporting fraud recognition model based on 12 financial indicators incremental. The goodness of fit of the model is 0.33, which has a certain explanatory power. There exists a positive correlation between the change rate of financial indicators and fraud probability of listed companies. The greater fluctuation of financial indicators incremental it is, the greater probability of fraud occurring. H1 assumption is confirmed by this conclusion. Through the regression results of the increment of the four financial indicators which reflect the quality of assets, we can see that the greater the changes in inventory turnover, current asset turnover, accounts receivable turnover, the greater

likelihood of fraud during that year and previous year. In order to reverse the adverse operating conditions of the previous year, fraud companies usually inflate accounts receivable, inventory, income, and other means to adjust the income statement, which result in inventory turnover, current asset turnover and accounts receivable turnover changes a lot over the previous year. In addition, due to mismanagement, fraud company's assets condition will not be very good, therefore there are less change in asset turnover.

**Table 4 Regression Analysis Results of Model One and Two**

Indicator	B	S.E	Wald	df	sig.	Exp(B)	Indicator	B	S.E	Wald	df	sig.	Exp(B)
X <sub>11</sub>	0.01	0.02	0.23	1	0.63	0.99	Y <sub>11</sub>	-1.21	1.46	0.68	1	0.408	0.3
							Y <sub>12</sub>	0.15	0.14	1.05	1	0.031	1.16
X <sub>12</sub>	0.06	0.03	5.26	1	0.02	0.94	Y <sub>21</sub>	0.03	0.07	0.25	1	0.617	1.04
							*Y <sub>22</sub>	0.53	0.49	1.18	1	0.028	1.7
X <sub>13</sub>	0.07	0.03	3.58	1	0.06	1.07	Y <sub>23</sub>	-0.2	0.16	1.57	1	0.21	1.22
							*Y <sub>24</sub>	-2.47	1.21	4.18	1	0.041	11.84
X <sub>14</sub>	0.3	0.11	7.29	1	0.01	1.34	Y <sub>25</sub>	0.34	0.52	0.42	1	0.052	1.4
							Y <sub>26</sub>	0	0.13	0	1	0.999	1
X <sub>21</sub>	2.72	0.93	8.64	1	0	15.2	Y <sub>31</sub>	0.25	0.52	0.24	1	0.627	0.78
							Y <sub>32</sub>	-0.12	0.16	0.54	1	0.463	0.89
X <sub>22</sub>	2.22	0.74	8.98	1	0	0.11	Y <sub>33</sub>	0.95	0.37	6.38	1	0.012	2.58
							Y <sub>41</sub>	-3.58	8.63	0.17	1	0.017	0.03
X <sub>23</sub>	0.13	0.23	0.31	1	0.58	1.14	Y <sub>42</sub>	-36.81	23.62	2.43	1	0.119	0
							*Y <sub>43</sub>	8.56	8.4	1.04	1	0.031	52.23
X <sub>24</sub>	0.27	0.15	3.26	1	0.07	1.31	Y <sub>51</sub>	0.63	0.54	1.34	1	0.247	1.87
							*Y <sub>52</sub>	-1.81	0.77	5.54	1	0.019	0.16
X <sub>31</sub>	1.18	0.46	6.52	1	0.01	3.25	Y <sub>61</sub>	0.15	4.93	0	1	0.098	1.17
X <sub>32</sub>	2.09	0.8	6.77	1	0.01	0.12	Y <sub>62</sub>	-0.01	0.01	1.32	1	0.25	0.99
X <sub>33</sub>	0.41	0.63	0.41	1	0.52	1.5	Y <sub>63</sub>	-107.33	510.62	0.04	1	0.834	0
X <sub>34</sub>	0.18	0.12	2.15	1	0.14	1.2	Y <sub>64</sub>	107.2	511.89	0.04	1	0.834	3.61
Constant	-0.33	0.19	3.12	1	0.08	0.72	Constant	4.23	3.69	1.31	1	0.252	68.38
-2 Log likelihood			196.529a				-2 Log likelihood			186.644a			
Cox & Snell R Square			0.25				Cox & Snell R Square			0.295			
Nagelkerke R Square			0.33				Nagelkerke R Square			0.33			

3.2.2 Regression analysis based on fraud recognition model of nonfinancial indicators

From the regression results (Table 5), the H2 hypothesis supported by the following evidence: Firstly, from the view of shareholder governance, the number of the annual general meeting of shareholders is negatively related to the probability of the fraud listed companies; Secondly, from the point of internal governance, the salient features of fraud companies is that: the more frequent change of chairman of the board, the less proportion of independent directors, as well as the chairman and general manager being the same individual; Thirdly, from the view of equity structure and concentration, increasing the stake of the Board will reduce supervision motivation of the board, encourage earnings management behaviour in different forms, which will increase the probability of fraud. Increasing the stake of manager will reduce the agency conflicts between shareholders and managers, which will decrease the probability of fraud. The higher ownership concentration it is, the more opportunity for

major shareholders to occupy small shareholders and the more likely financial reporting corrupt occur.

**Table 5 Regression Analysis Results of Model Three**

Indicator	B	S.E.	Wald	df	Sig.	Exp(B)	Indicator	B	S.E.	Wald	df	Sig.	Exp(B)
X <sub>11</sub>	0.01	0.02	0.64	1	0.42	1.01	Y <sub>22</sub>	0.57	0.51	1.23	1	0.27	1.77
X <sub>21</sub>	1.49	0.73	4.13	1	0.04	4.44	Y <sub>24</sub>	-2.3	1.06	4.71	1	0.03	9.98
X <sub>22</sub>	0.94	0.53	3.07	1	0.08	0.39	Y <sub>25</sub>	0.31	0.53	0.34	1	0.56	1.36
X <sub>23</sub>	0.11	0.21	0.27	1	0.6	1.12	Y <sub>31</sub>	0.92	0.39	5.65	1	0.02	2.52
X <sub>24</sub>	0.28	0.2	1.9	1	0.17	1.32	Y <sub>41</sub>	-3.85	5.36	0.52	1	0.47	46.77
X <sub>32</sub>	1.5	0.62	5.91	1	0.02	0.22	Y <sub>43</sub>	0.61	4.69	0.02	1	0.9	0.54
X <sub>33</sub>	1.25	0.54	5.25	1	0.02	3.49	Y <sub>52</sub>	-1.29	0.54	5.68	1	0.02	0.28
Y <sub>21</sub>	0.2	0.13	2.43	1	0.12	1.22	Y <sub>61</sub>	1.31	1.43	0.85	1	0.36	0.27
Constant	5.04	3.19	2.49	1	0.11	155.21	Constant	5.04	3.19	2.49	1	0.11	155.21
-2 Log likelihood						176.275a							
Cox & Snell R Square						0.33							
Nagelkerke R Square						0.44							

3.2.3 Recognition model of financial indicators and nonfinancial indicators

**Table 6 Classification Table for Observing the Amount**

Observed(model one)	Predicted(model one)				Predicted(model two)				Predicted(model three)			
	fraud		Percentage Correct		fraud		Percentage Correct		fraud		Percentage Correct	
	0	1			0	1			0	1		
fraud	0	71	18	79.78	65	24	73.03	72	17	80.9		
	1	40	49	55.06	25	64	71.91	24	65	73.0		
Overall Percentage				67.42			72.47			77.0		

Take the original samples into the model for forecast test, the classification of test results for the three models are shown in Table6. Under the identification method of single financial or nonfinancial indicators, the overall ability to identify listed companies' financial reporting fraud is 67.42% and 72.47%. As we identify the corrupt conduct of listed companies with the consolidated financial and nonfinancial indicators, it shows that 24 companies are considered as non-fraud companies by mistake, and 16 companies are considered as fraud companies among 89 companies by mistake, whose comprehensive correct rate is 77%. Our results provide empirical evidence that nonfinancial indicators have the power to aid fraud detection. Using financial indicators and nonfinancial indicators established by the logic model can predict the risk of fraud of listed companies more accurately, which has good value to identify listed companies' financial reporting fraud.

Take the original samples into the model for forecast test, test results for the three models are shown in Table6. Through empirical analysis, we can get conclusions as follows:

From the incremental view of the financial indicators, compared with non-fraud companies, fraud company's financial indicators fluctuated in the year and previous year. Therefore we can use financial indicators incremental combined with common means of listed companies' financial reporting fraud to identify the fraud of listed companies;

From the identification of nonfinancial indicators of corporate governance, the governance of the Board of Directors under the shareholders' meeting is more significant to identify listed companies fraud. Compared to its paired samples, Fraud samples have smaller independent directors' scale, more frequently changes in the board of directors and higher proportion holds in the board of directors. This shows that the board of directors can control fraud in listed companies. Increasing the proportion of

managerial ownership and their salaries can reduce the principal-agent problem to a certain extent. Therefore, an appropriate degree of ownership dispersion can decrease the probability of listed companies' corrupt conduct. This supported H2 assumption.

#### 4 Conclusions

We identify fraud sample punished by China Securities Regulatory Commission for its violation in the period 2006 to 2009 and does empirical analysis on the identification and governance of China's listed companies' financial reporting fraud. The changes in financial indicators of fraud listed companies are more significant; the internal governance of the fraud listed companies is weaker. Fraud identification model can help auditors, creditors, minority shareholders and other external stakeholders to identify listed companies' reporting fraud more easily, thus reduce loss of the information asymmetry. Compared with the single financial indicators and nonfinancial indicators model, using a combination of financial indicators and nonfinancial indicators of fraud recognition model has higher predictive accuracy.

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## Impact of Micro-credit Loans on Income and Innovation: An Evidence from Bangladesh

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**Abstract:** This study examines the effectiveness of micro-credit loans in terms of business innovation and income level. Using survey data of micro-credit clients from Bangladesh, the study finds that loan size has a positive effect on income level, although does not have positive and significant effect on business innovation but in the presence of innovation can generate more income. We find that general education is significant predictor of income level but has no relation with business innovation. The finding also suggests that competitive intensity has significant positive effect on income level but negative effect on business innovation. Therefore, this study has significant policy implications for micro-finance institutions, clients, practitioners and micro-credit regulatory authority.

**Key words:** Micro-credit, Innovation, Income, Loan effectiveness

### 1 Introduction

Innovations refer to either the novel combination of existing ideas and routines (Schumpeter, 1934), or more radical or incremental improvements in offering products or services that provide some distinct advantage over competitors. In developed economies, both positive incentives for income growth and negative incentives related to business survival drive companies to take risk through innovation (Baumol, 2002). In developing economies, the barriers to innovation are greater due to deficiencies in education, the institutional environment, technical infrastructure, social networks as well as financial resources (Aubert, 2010). For those able to overcome these obstacles and innovate, it is expected that there will be opportunities to generate higher income due to similar constraints on competitors (Bradley, Artz & Hulett, 2012). The idea of financial inclusion or providing micro-credit loans are now getting increased attention worldwide, based on the perception that a small amount of loan associated with some support services could overcome those barriers to innovation and transform the ideas of the poor people in to profitable income generation activities. Mohammad Yunus (pioneer of micro-credit model) and Grameen Bank popularized these efforts by providing loans to the poor through group lending practices rather than physical assets as collateral. This form of policy innovation of financial inclusion has been replicated worldwide with or without modification based on the different country contexts. With this success micro-finance has served 150 million borrowers with 39 billion USD in loans and holding, 22 billion in deposits from 67 million clients (Mix, 2010). The micro-finance movement in Bangladesh having been started since 1970s now is at the maturity level, and highly competitive; in some cases supplies of micro-credit products exceed demand. Trend shows that the number of branches of NGO-MFIs has increased over the last five years by 133%, whereas the number of clients and borrowers has increased only by 31.61% and 31.48% respectively during this period (MRA, 2009). Under such circumstances loan products without any productive use by the clients could have negative impact on the economy as well as society through over indebtedness and diminishing returns rather than enhancing income and poverty reduction. Therefore, study on the effect of micro-finance products on innovation and income generation could have practical implications for both microfinance institutions and clients as well as microfinance regulatory authorities for further modification of policy strategies. This study examined the direct and indirect effects of innovative activities as an important link in generating higher income for micro credit clients.

### 2 Literature Review and Hypothesis Development

The poor are thought to be precluded from entrepreneurship, not because they have failed to recognize profit potential, but because they lack the capital (human, social, and particularly financial) to exploit those opportunities (Aghion et al., 1999; Fishman and Simhon, 2002; Patrick, 1966). In such cases, lack of capital diminishes social welfare not only by denying the poor the capacity to increase their income and improve their standard of living, but also by preventing the development of a marketplace that views them as customers and seeks to serve their needs (Arndt, 1988; Karlan and

Morduch, 2009; Prahalad, 2009). Therefore, the underlying logic assumes that, if capital is expanded through efforts like education, skill training or access to networks or loan availability, then business development will necessarily follow. Based on this, following three hypotheses have been drawn.

*Hypothesis 1: General education increases analytical ability to assume opportunities and pursue innovative ideas. Therefore, general education has significant relation with (a) Innovation and (b) Income.*

*Hypothesis 2: Business training can be applied to recognize opportunities to innovate in the market. So business training has significant relation with (a) Innovation and (b) Income.*

*Hypothesis 3: Lack of capital prevents the poor from increasing their income through entrepreneurship. Consequently, loan size has significant relation with (a) Innovation and (b) Income.*

Financial resources allow time for new businesses to develop products/services, learn business processes and find a niche in the market. However, there is no guarantee that resources will be converted to value-added benefits to the resource holder. The process of income generation is also dependent on individual characteristics of the owner and their ability to locate and execute on opportunities in the environment in which the business operates (Bradley et al., 2012). Individuals higher in self efficacy (the belief in one's own ability to perform a given task) and locus of control (the belief in one's ability to influence the current environment) would be expected to pursue more novel ideas and generate greater income (Rotter, 1966; Bandura, 1997; Shane, 2003). Therefore, hypothesis four & five are-

*Hypothesis 4: Locus of control has significant relation with (a) Innovation and (b) Income.*

*Hypothesis 5: Self-efficacy has significant relation with (a) Innovation and (b) Income.*

As the density of competitors increase, more of the resources needed to build and sustain a business have been claimed by others leading to greater challenges in the ability for a business to survive, grow and generate income (Carroll and Hannan, 2000). Therefore, competition is expected to cause greater search for innovative business ideas while simultaneously making it more challenging to generate higher income (Bradley et al., 2012). So hypothesis six has been drawn as

*Hypothesis 6: Competitive intensity has positive relation with (a) Innovation and (b) Income.*

Those who have innovative ideas are more likely to convert loan capital into greater personal income. Prior work indicates that the creation of imitative businesses within microcredit groups offers diminished returns that make loan repayment more difficult (Bateman and Chang, 2008; Davis, 2006). As loan capital becomes more abundant through lending programs, well-known opportunities are more likely to be exploited. This suggests diminishing socio-economic returns on future funds invested by poor entrepreneurs unless the next wave of entrepreneurs discovers or creates opportunities that do not already exist in the market (Bradley et al. 2012). So it is assumed that micro-credit loan will be effective and sustainable only when business innovations are found to be present. Therefore, hypothesis seven is-

*Hypothesis 7: Innovation has significant relation with income.*

### 3 Methodologies

Although the impact of microfinance on income and innovation is not easy to measure, as successful entrepreneur not always active clients of micro-finance institutions and active clients are not always entrepreneur, moreover the loan capitals have not always been used for increasing income. However, we attempt to get the actual situation of microfinance clients' income and innovation effect. We took two villages of Tangail districts from Bangladesh and surveyed 200 clients through interview based on semi-structured questionnaire and found 88 micro entrepreneurs who have micro credit loans from micro-finance institutions. Among them 49 usable questionnaires have been used for this study.

The sample in this research is a judgement sample, a type of purposive sampling used in exploratory research in which the researcher selects a sample to meet specific criteria (Emory and Cooper, 1991). Dependent variable income level were measured using monthly family income within a given range, for example-'1'= 1-9000, '2'=10000-19000. Innovation was assessed by three items as a change in products, processes or markets. Competitive intensity was the number of firms competing in the same business. Loan size was current total loans outstanding and education was 1 to 5 numerical values like 1= primary education, 2=Secondary school education etc. Business training was assessed based on whether the client reported receiving training in business operations and its accompanied benefits which ranges from 1 to 5. For locus of control and self efficacy Likert scale (1-5) was used. Owner age, business age and number of dependents were included as control variables. Finally based on structural equation model, five linear regression models have been drawn to assess the direct and



indirect effect of innovations on income level.

#### 4 Model

Considering the literature review, Figure 1 can be adapted for the research objective. Figure 1 has been adapted from the work of (Bradley et al., 2012).

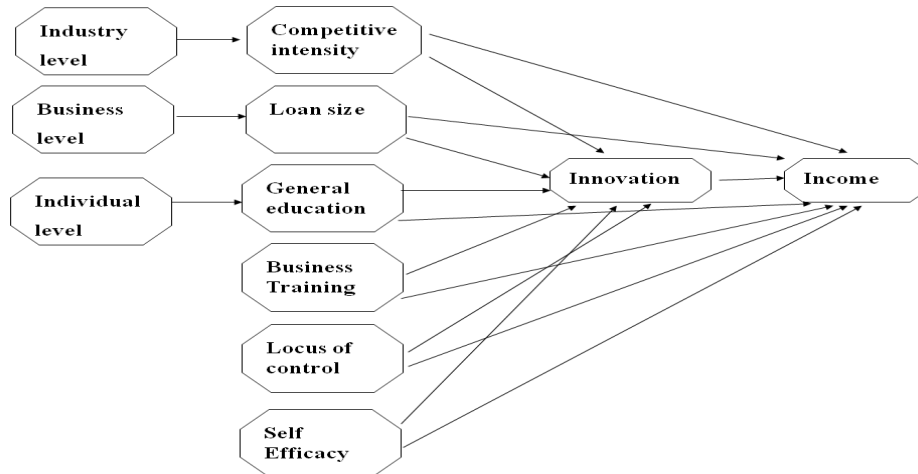


Figure 1 Factors Affecting Innovation and Income Level

#### 5 Result and Discussion

Table 1 provides descriptive statistics of the data. In table 2 we present the result of the structural equation model predicting innovation and income level. Model 4.1 is a baseline control model. Model 4.2 shows the direct effect of innovation on income level and no significant relationships were found. Model 4.3 and 4.4 test the significance of the environment, business and individual level indicators on innovation and income level. In model 4.3, owner age shows significant but negative association with innovation that means younger people are more likely to adopt innovative ideas. Competitive intensity was negative and significant predictor of innovation but was significant and positive predictor of income level. The result contradicts the findings of other previous analysis (Carroll & Hannan, 2000; Bradely et al., 2012 ). Although it is expected that more competitors in the same business will reduce the share of income/profit, but in our sample villages, they have competitive advantage in producing particular products which has demand over the whole country. Therefore, experience of competitors helps them enhance their skills in the same business and thereby, influence earnings positively. Loan size although was not a significant predictor of innovation (model 4.3) but was a positive and significant predictor of income level (model 4.4). When the fully specified model including innovation was tested in model 4.5, the result showed that loan capital becomes a significant predictor of income level in the presence of innovation. Thus loan size was (.268-.252=).016 times more likely to increase income level but only when innovations were taken into account. Similar with the findings of Bradely(2012) general education level did not predict innovation but did have a positive relationship with income level. Locus of control and self efficacy were positive and marginally significant ( $p=.053$  &  $.077$  respectively) predictor of innovation but did not significantly predict income level, more surprisingly was negatively related with income level. Miller (1986) and Mueller (2001) also found positive association between locus of control (high internal locus) and innovation strategies. Bradely (2012) found significant but negative association between locus of control and innovation but positive association with income. Analysis of variance shows that except the control model 4.1 & 4.2, rest of the model is highly significant. Full model 4.5 shows R square .600 that is 60% of the variance is accounted for the variables in the model.

#### 6 Conclusion

Based on the above findings we can accept hypothesis 1(b), 6 (a & b) and 7 that is competitive intensity is the significant predictor of innovation and income level and general education & innovation are the significant predictors of income level. Loan size although does not predict innovation but in the presence of innovation influence income level. Therefore, hypothesis 3(b) is accepted while 3(a) is

rejected. Early studies indicated loans improve participant income levels, increase the accumulation of assets and increase per capita household consumption (Hossain, 1988; Hashemi et al., 1996; Pitt and Khandker, 1998). Similarly, our study also found evidence for increased income. But evidence also shows that giving loans to poor household does not necessarily improve their livelihoods rather in some cases let them fall in chronic poverty. Loans made to clients for businesses with little or no potential for increasing income are detrimental to the person, the micro-credit agency and industry in the long run (Bradely et al., 2012). Therefore, micro-finance institutions need to focus on those issues that helps micro entrepreneurs to enhance their business earnings as well as general knowledge that could guide them to capture new opportunities from the environment and do business in a more innovative ways.

**Table 1 Correlation**

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1.Income Level	1.69	1.103											
2.Competitive Intensity	3.08	1.711	.405**	1									
3.Loan size	2.92	2.110	.419**	-.022	1								
4.Education Level	1.62	.789	.285*	-.124	-.112	1							
5.Business training	.37	1.185	-.119	.005	.137	-.141	1						
6.Locus of control	3.10	1.311	-.108	-.208	.206	-.194	-.011	1					
7.Self efficacy	3.33	.987	.055	-.229	.233	.135	.056	.183	1				
8.Innovation	2.54	1.271	-.097	-.426**	-.132	.001	-.040	.366*	.274	1			
9.Owner age	38.45	9.143	.244	.042	.273	-.008	-.339*	.119	.095	.303*	1		
10.Business age	2.69	1.503	.256	.217	.156	-.052	-.111	.101	.097	-.248	.748***	1	
11. No. of Dependents	4.47	1.082	-.121	-.067	.026	-.129	.106	.068	.049	-.029	.200	.423**	1

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

**Table 2 Regression Models Predicting Innovation and Family Income**

Variables	Model 4.1	Model 4.2	Model 4.3	Model 4.4	Model 4.5
Dependent Variables	Income level	Income level	Innovation	Income level	Income level
Controls					
Owner age	.057(.827)	.009(.974)	-.628(.049)*	.080(.743)	.094(.703)
Business age	.248(.151)	.280(.121)	.073(.710)	.173(.261)	.164(.276)
No.of dependents	-.279(.087)†	-.281(.090)†	-.009(.960)	-.146(.282)	-.148(.256)
Covariates					
Competitive Intensity			-.228(.043)*	.248(.006)**	.311(.001)***
Loan size			-.072(.408)	.252(.001)***	.268(.000)***
Education level			-.071(.739)	.493(.005)**	.511(.003)**
Business training			-.223(.196)	-.118(.326)	-.029(.826)
Locus of control			.267(.053)†	-.089(.395)	-.157(.150)
Self-efficacy			.318(.077)†	.001(.996)	-.094(.500)
Innovation		-.007(.955)			.276(.035)*
Goodness-of-fit					
R square	.131	.138	.440	.547	.600
Adjusted R square	.073	.057	.300	.437	.486
Standard error	1.062	1.078	1.068	.838	.806
F value	2.265	1.714	3.142	4.970	5.260
Sig	.094†	.164	.007	.000	.000
No.of predictors	3	4	9	9	10

\*p<0.05 ; \*\*p<0.01; \*\*\*p<0.001; †p<0.10

Note: Values within bracket indicate P value

The sample size in our study is not large enough to generalize the findings of the empirical results. Therefore, there is ample scope for further study with larger sample base in this sector.

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# Construction of Internal Risk Management System of Financial Holding Company

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**Abstract:** There are three special risks of financial holding company: contagion of risks, confliction of interests and overlapping calculation of capital. The paper analyzes two models for internal risk management system of the financial holding company: integral risk management model and dual one, and concludes that the former is helpful to the management of special risks of financial holding company. Hence, the improvement of governance structure for financial holding company is needed. Canceling the listed position of subsidiary and realizing or maintaining the listed position of financial holding company is a good way to solve the problem. In addition, it is suggested that the independent governor system for financial holding company should be improved.

**Key words:** Financial holding company; Special risks; Internal risk management system; Governance structure; Comparative analysis

## 1 Introduction

For purposes of this paper, a financial holding company is defined as a company that controls at least two types of financial institutions of the bank, securities company and insurance company, or defined as a company whose subsidiaries include at least two types of financial institutions of the bank, securities company and insurance company. The two definitions are the same because according to related law and regulations in China, controlling or being controlled is the criterion for judging the relationship between parent company and subsidiary. Financial holding company and its subsidiary constitute a financial group. In the following part of this paper, some "financial holding companies" refer to the financial group under the control of the financial holding company.

In recent years, financial holding companies have developed rapidly in the United States, Britain, Japan and other countries. However, the system of separated operations and regulations is still be taken in China, which may make China's financial industry have more difficulties in adapting to the trend of mixed operation in the world. The financial holding company is a realistic choice for China's financial industry to transform from separated operation to mixed operation, because the financial holding company faces fewer restrictions, can benefit from the effects of scope economy and scale economy and is suitable to the current conditions of risk management of China's financial institutions.

However, the structure of financial holding company may bring about some special risks. Freixas and Loranth (2007) study the risk-taking incentives of a financial conglomerate and conclude that when capital requirements are set optimally, capital arbitrage within holding company conglomerates can raise welfare by increasing market discipline. Wang Zili (2008) investigates the risks of financial holding company and argues that China should establish unified supervisory institution. Xie Chuanbo and An Lijuan (2010) contend that in order to improve the supervisory framework of financial holding company in China, the supervisory responsibility and scope should be clearly defined, the precaution mechanism should be established and external audit should be enhanced. Knaup and Wagner (2012) find that estimated tail risk exposures for U.S. bank holding companies are negatively correlated with their share price beta, suggesting that banks which appear safer in normal periods are actually more crisis prone than their beta would suggest. Adams and Mehran (2012) analyze the relationship between independence and size of bank board and performance and conclude that governance regulation should take unique features of bank governance into account. In sum, the risks of financial holding company and the external supervisory model are discussed more frequently, however, the internal management system of financial holding company have not been discussed detailed. The paper aims at analyzing the construction of internal risk management system of financial holding company.

The layout of this paper is as follows. Section 2 analyzes special risks of financial holding companies, Section 3 discusses the selection of models for internal risk management system of the financial holding company in China, Section 4 discusses the improvement of governance structure for financial holding company, and Section 5 concludes.

## **2 Special Risks of Financial Holding Companies**

### **2.1 Contagion of risks**

Under the framework of financial holding company, the financial troubles in one member of the group, for example the lack of solvency or liquidity, may spread to other members in the group, endangering the financial institutions especially commercial banks, damaging the interests of depositors and the public, creating systemic risks and making the financial system instable. The contagion of risks is mainly via affiliate transactions. *Intra-Group Transactions and Exposures Principles* issued by Basel Committee on Banking Supervision, International Organization of Securities Commissions and International Association of Insurance Supervisors enumerates the main affiliate transactions in the group, which include: 1) cross shareholdings; 2) trading operations whereby one group company deals with, or on behalf of, another group company; 3) central management of short-term liquidity within the conglomerate; 4) guarantees, loans and commitments provided to, or received from, other companies in the group; 5) the provision of management and other service management, e.g. pension arrangements or back office services, etc. On one hand, affiliate transactions facilitate financial holding company to fulfill the effects of scope economy and synergies. On the other hand, they make it easier for risks in one entity to spread to other entities in the group. Thus, they must be well managed.

### **2.2 Confliction of interests**

Another risk of financial holding company is the confliction of interests. The group controlled by the financial holding company offers banking, securities and insurance services as a whole, and the multi-role can result in confliction of interests, which may include: 1) financial institution may offer misleading suggestions to customers and damage their interests when it can sell the products of another institution in the group; 2) commercial bank may loan to the third party non-prudentially in order to help the security company within the group underwrite or sell securities; 3) the financial holding company can get the information of the increase of customer's bankruptcy risks through subsidiaries' loan and insurance services, and transfer the risk to the public by persuading the customers to issue bonds or shares, etc.

### **2.3 Overlapping calculation of capital**

Overlapping calculation of capital occurs when two or more entities in the group controlled by the financial holding company cover risks with the common capital. When the parent company obtains equity fund from outside, the fund becomes the capital and assets of the parent company. If the parent company invests to subsidiary using a part of assets as the long-term investment, the investment fund becomes the capital and assets of the subsidiary. It looks as if the capital of the group as a whole equals the sum of subsidiaries' capital. But in fact, the investment fund of parent company to the subsidiary is calculated twice and results in overlapping calculation of capital. Thus, it must be eliminated. Otherwise the capital level of the group will be overestimated. Furthermore, if the subsidiary invests to its subsidiary with a part of assets as long-term investment, the investment fund will be calculated overlapped once again. In a word, the volume of the group's capital as a whole only consists of the capital from outside. Lack of approaches and mechanism to eliminate the overlapping calculation will result in overestimation of the group's capital level.

## **3 The Selection of Model for Internal Risk Management System in China**

### **3.1 The classification of models**

The model of internal risk management system of financial holding company is related to the juristic and regulatory system, as well as the structure of the financial holding company. Therefore, it has the feature of diversification. But it can be classified into two categories.

1) Integral risk management model. Under this model, the financial holding company participates subsidiary's risk management directly. Although the holding company and subsidiary build their risk management framework respectively, and risk management committee is set up under the board of governors and is responsible for guiding risk management department, it is the risk management department of the holding company that makes unified risk management strategies, polices and institution, directly manages and supervises the subsidiaries' risk management. The risk management staffs of subsidiaries are under the control of holding company, fulfilling their duty of risk management on behalf of the holding company. This model has the characteristics of integral risk management. And the holding company can view the overall risks of the whole group comprehensively and timely. Thus it is helpful to the management of special risks under the framework of financial holding company.

2) Dual risk management model. Under this model, the financial holding company just acts as

controlling shareholder and guides subsidiary's risk management indirectly by influencing the board of governors and risk management committee of subsidiary. Both the holding company and subsidiaries set up their risk management organizations respectively. The risk management department of the holding company makes the overall risk management policies, directs and supervises the risk management of subsidiaries. Nevertheless the subsidiaries' policies of risk management are carried out by the committee and department of risk management of subsidiary. And the risk management committee of subsidiary is led by the board of governors of the subsidiary. The features of this model are that subsidiaries have more rights and take more responsibilities in risk management, which is useful to tighten the linkage between business operation and risk management. However, the control imposed by holding company on subsidiary is weakened. Hence, the holding company has more difficulties in coordination and management of special risks of financial holding company.

### **3.2 The selection of models in China**

The selection of internal risk management system must comply with law and regulations of supervisory institutions. *The Listed Company Governance Principles* issued by China Securities Regulatory Commission have some regulations on behaviors of controlling shareholders and independence of listed companies, which include:

1) The controlling shareholder takes fiduciary duties to the listed company and other shareholders. The nomination for candidates of governors and supervisors of the listed company must comply with the qualifications and procedures set by laws, regulations and company constitutions. The candidates nominated by controlling shareholders should have related professional knowledge and supervisory ability. The controlling shareholder has no rights to approve the personnel resolution made by the general meeting of shareholders and board of governors, and must not appoint or remove top managements surpassing the general meeting of shareholders and board of governors of the listed companies. And the controlling shareholder must not interfere with the company's decisions and legal businesses directly or indirectly, impairing the interests of the company and other shareholders.

2) The controlling shareholder and listed company should separate their staffs, assets, finance, institutions and businesses, calculate their costs and profits and take responsibilities and risks respectively. The board of governors, committee of supervisors and other institutions of the listed company should run independently. There do not exist superior or subordinate relationship between controlling shareholder, its departments and listed company and its departments. The controlling shareholder and its departments must not make plans for or order listed company and its departments concerning the operation of listed company, nor affecting listed company's independence in operation and management. Controlling shareholder and its other affiliates must not run businesses that are the same to or similar with those of listed company. And effective measures should be taken by controlling shareholders to avoid horizontal competition.

Hence, if the subsidiary of financial holding company is a listed one, integral risk management model can not be adopted. If it is not listed, there doesn't exist such restriction. Furthermore, integral risk management model can be adopted if the subsidiary is wholly owned by the financial holding company. And dual risk management model should be adopted if the subsidiary is not wholly owned by the financial holding company for the purpose of protecting the interests of non-controlling shareholders.

## **4 The Improvement of Governance Structure for Financial Holding Company**

### **4.1 The governance between financial holding company and its subsidiary**

In order to make the best of synergies and take the integral risk management model, it is demanded that the parent company have very strong control over subsidiary. In general, parent company has stronger control on non-listed subsidiary than on listed subsidiary given the same portion of shares held by the parent company. And parent company has stronger control on wholly-owned subsidiary than on non-wholly-owned subsidiary. Nevertheless, both the parent company and the subsidiary are independent entities, it is an important issue how to build good governance structure between the parent company and subsidiary in order to make the best of synergies and protect the interests of non-controlling shareholders. Canceling the listed position of subsidiary (if it is listed) and realizing or maintaining the listed position of financial holding company (parent company) is a good way to solve the problem.

In addition, the advantages of financial holding company's (parent company's) being listed are as follows: financial holding company's being listed is useful to diversity of equity, which is helpful in

solving the problem of ambiguousness of ownership; In general, law and supervisory institutions in most countries have fewer restrictions on capital operation such as M&As conducted by financial holding company than those conducted by banks. Being listed of financial holding company instead of subsidiary benefits large scaled M&As, which is important to the expansion of the group.

In order to cancel the listed position of subsidiary and realize or maintain the listed position of the financial holding company (parent company), operation transfer and share exchange are two important ways in addition to the financial holding company is listed directly and set up or takeover subsidiaries.

1) Operation transfer. If the former financial institution is a listed company, the financial holding company (parent company) becomes the listed company, and the shareholders of former financial institution become the shareholders of the financial holding company (parent company). The company that receives the business, assets and liabilities of the former financial institution becomes the subsidiary of the financial holding company.

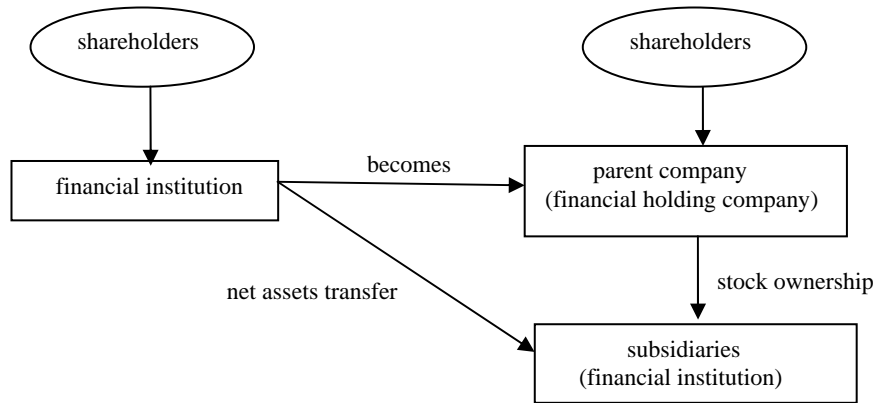


Figure 1 Operation Transfer

2) Share exchange. If a financial institution is a listed company and the financial holding company does not exist, the shareholders of the financial holding company transfer all the shares of the financial institution to the future financial holding company, then the financial institution becomes the wholly-owned subsidiary and the listed position is cancelled, the shareholders of former financial institution become the shareholders of the financial holding company, and the financial holding company becomes the listed company. If an existing financial holding company wants to takeover a listed financial institution and make it become the wholly-owned subsidiary, the procedure is similar. The shareholders of financial institution transfer all the shares of the financial institution to the existing financial holding company. And the financial institution becomes the wholly-owned subsidiary of the financial holding company and the listed position is cancelled. At the same time, the former shareholders of the financial institution get the newly-issued shares and become the shareholders of the financial holding company.

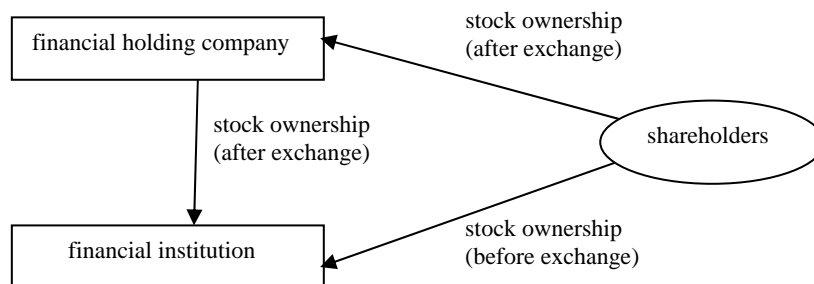


Figure 2 Share Exchange

**4.2 The independent governor system for financial holding company**

Independent governors refer to the governors that have no significant relations with the company. According to the regulations of the US Securities Exchange Commission, “Having no significant relations” includes the conditions as follows: The independent governors are not the former executive

directors of the company and have no professional relations, are not important consumers or suppliers, are not recommended or appointed on the basis of personal relationship, have no close personal relationship with any executive director, have no significant shares of the company, and do not represent any important shareholder of the company. The independent governors can play an important role in the governance of the financial holding company, supervising the operation and managements of the company, making balance between controlling shareholders and other shareholders, monitoring the affiliate transactions of the financial holding company, etc.

At present, the financial regulatory institutions of China have some requirements on the independent governor system of shareholding-system commercial banks, but have no regulations on financial holding company. *The Independent Governor and External Supervisor of Shareholding-system Commercial Bank Guidelines* issued by the People's Bank of China has guidelines as follows: The board of governors of shareholding-system commercial banks should include at least two independent governors, who express their objective, impartial and independent opinions about the issues discussed by the board of governors. The independent governors should pay more attentions to significant affiliate transactions, the plan of profit distribution, the appointment or remove of top managements, the items that may result in significant losses to commercial banks or damage the interests of depositors and small shareholders. The guidelines set also regulations to the qualifications of independent governors of shareholding-system commercial banks. The paper suggests that regulations with respect to independent supervisor system of financial holding company should be made, taking reference to *The Independent Governor and External Supervisor of Shareholding-system Commercial Bank Guidelines*.

## 5 Conclusion

Financial holding companies have three special risks: contagion of risks, confliction of interests and overlapping calculation of capital. There are two models for internal risk management system: integral risk management model and dual one. And the former is more helpful to the management of special risks of financial holding company. If the subsidiary of financial holding company is a listed one, integral risk management model can not be adopted. If it is not listed, there does not exist such restriction. Furthermore, integral risk management model can be adopted if the subsidiary is wholly owned by the financial holding company. And dual risk management model should be adopted if the subsidiary is not wholly owned by the financial holding company. Therefore, the improvement of governance structure for financial holding company is needed. Canceling the listed position of subsidiary (if it is listed) and realizing or maintaining the listed position of financial holding company (parent company) is a good way to solve the problem. In addition, it is suggested that the independent governor system for financial holding company should be improved.

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## Learning to Graft

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**Abstract:** Given the rapid change in the high-technology industries, many firms in these industries undertake acquisitions to get access to new capabilities. These acquisitions, however, are often destined to fail. Post-acquisition capability transfer implications have been mentioned as the primary reason for such high failure rates. Nonetheless, we still do not know how to enhance post-acquisition transfer of target's capabilities. Prior post-acquisition research has broadly focused on two aspects, namely: post-acquisition capability transfer vs. developing a general acquisition capability. This present study argues for a synthesis of these two prior post acquisition literature streams. As a result, the importance of a grafting capability—that is, an acquisition capability specifically developed for transferring capabilities—is recognized. The findings of this study show that in contrast with the existing literature on capabilities that focuses more on deliberate learning mechanisms, the microfoundations of such a grafting capability are search activities—that is, ad hoc problem solving. In addition, it is shown that the effect of such search activities could be strengthening when firms involved have common knowledge.

**Key words:** Grafting capability; Microfoundations; Post-acquisition capability;

### 1 Introduction

In order to understand performance variations across firms, the concept of organisational capabilities has been the focus of many strategy scholars for the past decades. In essence, an organisational capability refers to a learned behavior of the firm that enables it to carry out certain activities successfully—or preferably, more successfully than competitors can (Nelson & Winter, 1982; Winter, 2003). Such behavior has been argued to emanate from two forms of learning: experiential learning and learning from others (e.g. Levitt & March, 1988). Experiential learning represents learning by actually experiencing the task at hand, that is, by doing (Argote & Greve, 2007; Dosi & Marengo, 2007; Huber, 1991; Levitt & March, 1988). Learning from others can take place, according to Huber (1991), through vicarious learning and grafting. Vicarious learning represents learning about the practices of other organizations, for example, by imitating them (Huber, 1991). Grafting, on the other hand, constitutes a form of learning whereby the focal firm acquires capabilities through access to new members, such as in the case of an acquisition (Huber, 1991; Madhok, 1997; Puranam, Singh, & Zollo, 2006). Hence, in the case of vicarious learning, the focal firm learns from others by tapping into their experience more or less indirectly, whereas in the case of grafting the focal firm makes those “others” part of its own organization and thus, has the opportunity to tap into the desired capability directly (e.g., Argote & Miron-Spektor, 2011).

Given the rapid change in high-velocity environments such as high-technology industries, firms frequently choose to acquire new capabilities instead of developing them internally (hereafter called ‘capability-based acquisitions’), which points to the importance of grafting as a vehicle for gaining competitive advantage (e.g. Ahuja & Katila, 2001; Madhok, 1997; Makri, Hitt, & Lane, 2010; Puranam et al., 2006; Ranft & Lord, 2002). Clearly, however, simply acquiring a target firm by no means guarantees that its capabilities will be successfully grafted onto the acquirer’s organization (e.g. Bresman, Birkinshaw, & Nobel, 2010; Ranft & Lord, 2002). Thus, capability-based acquisitions seem to be prone to failure (Barkema & Schijven, 2008a; Bresman et al., 2010; King, Dalton, Daily, & Covin, 2004). Post-acquisition integration problems have been mentioned as one of the main reasons for acquisition failure (Puranam, Singh, & Zollo, 2003; Vermeulen & Barkema, 2001). Therefore, understanding how to enhance post-acquisition learning among employees of the acquired and acquiring firm and thus, capability transfer of capability-based acquisitions, would be a crucial step forward to increasing acquisition performance.

Given that the roots of organisational learning can, by and large, be traced back to two foundational theories—that is, the behavioral theory of the firm (Cyert & March, 1963) and evolutionary economics (Nelson & Winter, 1982)—it is not surprising that these two theories play leading roles in the growing literature on learning in the context of acquisitions. Thus far, prior research has developed arguments

along two lines. One stream of literature, while taking into account various important aspects that could play a role during post-acquisition capability transfer—such as the importance of the size of the firms involved, of having common knowledge, and of retaining key employees—emphasizes the importance of social integration and thus, the development of a new joint social community post-acquisition (Birkinshaw, Bresman, & Håkanson, 2000; Bresman, Birkinshaw, & Nobel, 1999; Bresman et al., 2010; Ranft, 2006; Ranft & Lord, 2002; Schweizer, 2005; Verbeke, 2010). This approach highlights the role of ad hoc problem solving which ensures that employees collectively search for solutions while collaborating and building the needed social relationships in order to enhance learning, which is in line with the behavioral theory of the firm. On the other hand, strategy scholars, more in line with evolutionary economics, have argued for the importance of routinized activities in the form of deliberate learning mechanisms for experience accumulation, articulation, and codification—such as an M&A department, or an M&A repository or retrieval system—which could enhance learning from the acquisition process by developing an acquisition integration capability (hereafter called ‘acquisition capability’) (Amiryany, Huysman, De Man, & Cloudt, 2012; Barkema & Schijven, 2008b; Helfat et al., 2007; Zollo, Reuer, & Singh, 2002; Zollo & Singh, 2004; Zollo & Winter, 2002).

However, it is rather surprising that, with the exception of work addressing the importance of transferring capabilities (Birkinshaw et al., 2000; Bresman et al., 1999, 2010; Ranft, 2006; Ranft & Lord, 2002; Schweizer, 2005; Verbeke, 2010) and a few studies emphasizing the importance of post-acquisition integration issues of such capability-based acquisitions (Puranam, Singh, & Chaudhuri, 2009; Puranam et al., 2003, 2006; Puranam & Srikanth, 2007), little research to date has pursued a deeper understanding of how firms can learn to graft and thus, develop a grafting capability. In other words, a synthesis of the above-mentioned two streams of research, namely: grafting itself and developing a capability to be able to graft successfully, is still lacking. Indeed, notwithstanding the contributions of prior research, we still neither know how the actual grafting process takes place, nor how firms can learn to graft (e.g. Amiryany et al., 2012; Felin & Foss, 2005, 2009; Foss, 2007; Foss, Husted, & Michailova, 2010; Helfat et al., 2007). This has some implications. On the one hand, research needs to reveal whether it is justifiable to recommend deliberate learning mechanisms for developing a grafting capability. On the other hand, if this is the case, one needs to question what such mechanisms should advise, for example, in the case of an M&A department trying to enhance capability transfer or contain such as in the case of an M&A repository or retrieval system. However, if this is not the case, what should firms, then, do to enhance grafting? Should firms, for example, rely more on ad hoc problem solving as proposed by the behavioral stream of research?

Acquirers that rely on capability-based acquisitions not only need to learn the focal target’s capability, but also need to learn how to engage in this grafting process more effectively for future acquisitions, that is, to develop a grafting capability as distinct from a general acquisition capability. This is because the latter could also be related to non-high-technology firms, focusing on integration issues regardless of the importance of getting access to new capabilities such as in the case of acquisitions meant to gain access to new clients, whereas the former—a grafting capability—is a capability required when involved in capability-based acquisitions, meant to ensure that target capabilities are transferred successfully post-acquisition. However, developing such grafting capability that is focused on integrating those acquisitions that are meant to get access to new capabilities, has not been the focus of research until now. Therefore, gaining more understanding regarding the microfoundations of a grafting capability and thus, how such capability can be built, is vital in order to extend existing theory. In addition, given the high failure rates of acquisitions (Barkema & Schijven, 2008a; Bresman et al., 2010; Hayward, 2002; King et al., 2004; Ranft, 2006)—in particular capability-based acquisitions—and the increasing importance of capability-based acquisitions in high-velocity environments, gaining deeper insight into the grafting process and how acquirers can develop a fruitful capability for this process, also has a practical value. This paper aims to shed more light on these issues, based on quantitative and qualitative data gathered in the context of high-technology acquisitions that serve to gain access to new capabilities. More specifically, this paper seeks to answer the question of how firms can learn to graft while taking into account what the specific activities are that enhance learning through grafting, in an effort to understand what the microfoundations of a grafting capability are.

In the next sections, while building up to our hypotheses, we will first provide some background information on relevant acquisition literature and then discuss how grafting can be enhanced. Second, a description of the methodology of our study will be given. Third, after discussing our study’s method, we will elaborate on the data and test our hypotheses. Finally, a discussion is provided.

## 2 Background

### 2.1 Acquiring to Learn: Grafting

Firms in the high-technology industries increasingly acquire other, often smaller, firms in order to gain access to their capabilities (Bresman et al., 2010; Kapoor & Lim, 2007; Makri et al., 2010). These firms are interested in highly tacit capabilities of the acquired firms, which are often in the heads of their employees and embedded in their routines and social relationships (Birkinshaw et al., 2000; Bresman et al., 1999, 2010; Ranft & Lord, 2002; Schweizer, 2005). This is why such firms acquire a whole company instead of just buying, for example, patents or hiring certain individuals. These acquirers need to acquire the target firms in order to be able to learn what their employees know and how they conduct their activities. Acquiring to learn—that is, grafting—however, often does not lead to the desired objectives, given that such acquisitions are prone to failure (Finkelstein & Cooper, 2010; Graebner, Eisenhardt, & Roundy, 2010; Haleblian, Devers, McNamara, Carpenter, & Davison, 2009). Post-acquisition integration issues are commonly acknowledged to be the key source of such high failure rates. In other words, firms usually struggle when trying to transfer target capabilities post-acquisition (Bresman et al., 2010; Puranam et al., 2003).

Given the complexity and importance of post-acquisition capability transfer, a growing body of literature in strategic management has focused on gaining insight into how to transfer capabilities post-acquisition (Graebner, 2004; Kapoor & Lim, 2007; Ranft, 2006; Ranft & Lord, 2002; Schweizer, 2005). Prior research has addressed this question by taking into account various issues. For example, prior studies argue that the size of the firms involved matters, given that larger target firms tend to complicate the integration process. This is because firms need to retain more people, invest more in communication, and give the acquired firm more autonomy (Ernst & Vitt, 2002; Kapoor & Lim, 2007; Laamanen & Keil, 2008). In addition, the existence of common knowledge has been mentioned as an important ingredient for effective post-acquisition capability transfer, since it enables employees to better understand one another's expertise (Ahuja & Katila, 2001; Cummings & Teng, 2003; Puranam et al., 2009).

Furthermore, the various dimensions of acquisition integration such as speed, communication, autonomy, and retention of key employees, have been an issue of concern as well (Ranft, 2006; Ranft & Lord, 2002). In line with this, prior studies have found that post-acquisition capability transfer greatly depends on the degree of social integration achieved that involves a gradual process of getting to know each other and learning from one another, which leads to developing a new joint social community post-acquisition that is mentioned to be essential for creating value through capability-based acquisitions (e.g., Birkinshaw et al., 2000; Bresman et al., 1999, 2010; Puranam et al., 2006; Schweizer, 2005; Verbeke, 2010).

Understanding how to socially integrate the companies post-acquisition while not disturbing existing relationships and giving the acquired firm the necessary autonomy has been considered vital for post-acquisition transfer of capabilities (Birkinshaw et al., 2000; Bresman et al., 1999, 2010; Puranam et al., 2009; Puranam et al., 2006; Puranam & Srikanth, 2007; Verbeke, 2010). It is the effect of such social integration that creates value post-acquisition by enabling firms to access the capability of the acquired firm. In order to achieve such social integration, enhancing interaction among employees and having rich communication is critical, since getting to know and trust one another is a prerequisite to start collaborating and thus, transferring the highly tacit capability in question (Birkinshaw et al., 2000; Bresman et al., 1999, 2010; Graebner, 2004; Graebner et al., 2010; Schweizer, 2005).

In other words, various aspects have been mentioned by prior research to play an important for transferring the capability in question, but what is essential is to have the companies socially integrated and thus, having a new joint social community in which the employees of both firms are involved (Bresman et al., 2010; Verbeke, 2010). This new social community, in turn, can be created by enhancing interaction among employees and having rich communication. However, knowing what the important variables are that affect post-acquisition capability transfer does not necessarily imply that this knowledge will actually be applied in practice. Research on grafting through acquisitions has predominantly focused on the implications of transferring capabilities and not on how firms can develop a capability for being successful in undertaking acquisitions. This is why

another stream of literature has focused on why certain firms are more successful in their post-acquisition endeavors than others and thus, how they have learned to acquire. Having an acquisition capability is considered vital in order to engage in acquisitions successfully. In the following section we will elaborate on the importance of such acquisition capability.

### **2.2 Learning to Acquire: Acquisition Capability**

A handful of active acquirers, such as Cisco Systems and General Electric, are widely praised for their acquisition capability. These firms are able to conduct their integration efforts in a way that many firms cannot or, more precisely, in a way that most firms are unable to (Heimeriks, Schijven, & Gates, 2012). Prior research attributes such firms' capabilities to the fact that they have the required deliberate learning mechanisms in place to accumulate experiences, and articulate and codify the knowledge gained from such experiences (Barkema & Schijven, 2008b; Heimeriks et al., 2012; Zollo & Singh, 2004). First of all, concerning their experience accumulation efforts, such firms have been conducting numerous acquisitions over the course of their lives, allowing them to have the requisite experience to know what is essential and what is not when involved in post-acquisition integration activities. In doing so, having done acquisitions in similar business areas could be of greater value, since related businesses enable firms to more directly draw conclusions from their experiences for future events (Hayward, 2002; Vermeulen & Barkema, 2001).

In addition to having accumulated the needed experience, successful acquirers tend to have certain organisational practices in place that, in combination with their experience, give rise to their acquisition capability. First, these firms usually have—on a corporate level—dedicated functions in place, such as an M&A department, team, or manager, which are responsible for the acquisition process and thus, for experience accumulation related to this process (Amiryany et al., 2012; Barkema & Schijven, 2008b; Helfat et al., 2007; Zollo & Singh, 2004). Second, these firms ensure that such dedicated functions articulate their experiences from previous acquisitions in order to learn from them, for example by conducting post-acquisition evaluations (Amiryany et al., 2012; Barkema & Schijven, 2008b; Helfat et al., 2007; Zollo & Singh, 2004). Third, codification of past experiences into documents to develop routines for subsequent events is another deliberate learning mechanism that such firms often have in place (Amiryany et al., 2012; Barkema & Schijven, 2008b; Helfat et al., 2007; Zollo & Singh, 2004). Furthermore, besides experience accumulation, articulation, and codification, recent research has shown that such firms also engage in what are called 'risk management' practices, which are meant to ensure that distributed knowledge across the firm, related to acquisition integration, is not applied to a deal at hand without being customized (Heimeriks et al., 2012). Hence, firms successful at acquisition integration apply what they have learned over the course of their lives in a highly systematic matter, while being cautious about not making incorrect inferences.

However, the literature focusing on the importance of such acquisition capability has been dealing with all types of acquisitions in general and not capability-based acquisitions in particular. Given the focus on transferring capabilities and the highly tacit nature of the capabilities that are meant to be transferred by means of such capability-based acquisitions, it is important to realize that such acquisitions require an acquisition capability that is distinct from the one that deals with integration issues in general. The specific capability required for fruitfully conducting capability-based acquisitions is called a 'grafting capability' throughout this paper, which is discussed in the following section.

### **2.3 Learning to Acquire to Learn: Grafting Capability**

The concept of grafting capability synthesizes the elements mentioned in the previous two sections, namely "acquiring to learn" (i.e., grafting) and "learning to acquire" (i.e., a generic acquisition capability). In other words, a grafting capability is a specific type of acquisition capability focused on integrating acquisitions that serve to gain access to new capabilities of the acquired firm. Given the typically tacit nature of the capability in question that is meant to be acquired when involved in capability-based acquisitions, having a grafting capability plays an important role, since gaining access to the target firm's unique capabilities requires different organisational practices than other types of acquisitions, such as those focused on, for example, accessing new clients and markets. A grafting capability needs to deal with the transfer of highly

tacit capabilities that are in the heads of individuals and embedded in the organisational routines and practices of the target firm. More precisely, such grafting capability ensures that the acquirer is able to transfer the capability of the acquired firm without disrupting the important routines and social relationships that underpin the acquired firm's capability. Hence, such grafting capability is meant to ensure that the acquisition process does not destroy the very reason for doing the acquisition in the first place. In the next section, we will elaborate on how grafting can be enhanced in order to make inferences on what the microfoundations of a grafting capability could be.

## 2 Theory and Hypotheses

### 3.1 Enhancing Grafting

In order to understand how to engage in successful grafting, one needs to know how such a complex organisational learning process takes place. As touched on in the introduction, the roots of the existing literature on organisational learning can largely be traced back to two foundational theories: the behavioral theory of the firm (Cyert & March, 1963) and evolutionary economics (Nelson & Winter, 1982). On the one hand, the behavioral theory of the firm focuses on firms' decision making (Cyert & March, 1963; Gavetti, Levinthal, & Ocasio, 2007). Organisational learning from this perspective assumes that that firms invest time and resources to search for a set of alternative courses of action for a given task, compare them, choose the most appropriate option given the task at hand, and learn from the resulting experiences to improve the odds of success of subsequent events. Thus, organisational learning from a behavioral theory of the firm perspective aims to reveal how such learning based on firm's decision making takes place. Understanding how the process of learning unfolds is a central theme in this research stream (Argote & Greve, 2007). Scholars from this tradition recognize the importance of both standard operating procedures and search activities for firms' decision making. This has resulted in subsequent related acquisition literature embracing the importance of close collaboration and interaction—when involved in grafting activities (Puranam et al., 2006; Puranam & Srikanth, 2007). Frequent interaction and close collaboration that include searching together for solutions, which are labeled throughout this paper as 'search activities', have been argued to have a positive effect on capability transfer and hence, on the performance of capability-based acquisitions (Birkinshaw et al., 2000; Bresman et al., 2010; Ranft, 2006; Ranft & Lord, 2002; Verbeke, 2010).

On the other hand, in contrast to the behavioral theory of the firm, evolutionary economics focuses on routinization of activities which ensures that firms can economize on the process of searching for solutions based on their past experiences, leading to these experiences becoming their routine way of doing things. This approach, in turn, allows routines to rise and get refined over time as firms keep accumulating experiences. In time, by having created the needed routines on which they can count, firms are able to develop certain organisational capabilities to outperform others. This is because such firms know what the best solutions are based on their experiences and can apply these solutions efficiently by means of their routines. In other words, the way that firms are able to carry out certain activities better than competitors is assumed to be captured by their routines. Thus, evolutionary theory highlights routines as the focus of attention to understand how firms learn and develop certain capabilities (Nelson & Winter, 1982, 2002). Hence, the aim of organisational learning from this perspective is to reveal how firms, given the stabilizing role of routines and the existence of search processes as generators of change in routines, learn to improve their performance by developing certain capabilities (Argote & Greve, 2007; Gavetti et al., 2007; Nelson & Winter, 1982, 2002). This important role of routines has led many firms involved in acquisitions to share their routines with each other in an attempt to gain access to the other firm's capabilities and thus to learn from each other, an activity labeled throughout this paper as 'routine sharing' (e.g. Zollo & Singh, 2004).

In addition to search activities and routine sharing, firms have been trying to develop an acquisition capability in order to enhance grafting by means of deliberate learning mechanism such as M&A departments for experience accumulation, post-acquisition assessments for articulation, and M&A repositories and retrieval systems for codification, which are labeled throughout this paper as 'institutionalized mechanisms' (e.g. Barkema & Schijven, 2008b; Zollo & Singh, 2004; Zollo & Winter, 2002). Having such institutionalized mechanisms in place, as part of a firm's grafting capability, is argued to have a positive effect on acquisitions performance (Amiryany et al., 2012; Helfat et al., 2007; Hitt et al., 2009). This is because such institutionalized mechanisms are assumed to embody—on a corporate level—firm's past learning related to acquisitions integration. The effect of such institutionalized mechanisms, however, should still be empirically tested, as is the case with search

activities as well as routine sharing when it comes to developing a grafting capability (e.g. Amiriany et al., 2012; Helfat et al., 2007). Finally, regardless of the mechanisms used to enhance capability transfer, it is argued that having common knowledge—“knowledge that is shared and known to be shared”(Puranam et al., 2009)—will be beneficial for this process. This is because the employees of the acquired and acquiring firm are more aware of what the other party knows and thus, better able to adjust their activities to one another. Therefore, this, in turn, means that when having common knowledge search activities and routines sharing will be more effective since employees are better able to understand each other and the documents that are being exchanged—while collaborating post-acquisitions.

In the following sections, while discussing the concepts that are depicted in our research model in Figure 1 and building up to our hypotheses, in line with the behavioral theory of the firm and evolutionary economics, we start off by discussing two distinct activities that firms use when trying to enhance grafting, that is, search activities and routine sharing, respectively. Subsequently, we will discuss how the process of grafting could be affected by institutionalized mechanisms that are proposed by strategy scholars and by having firms involved that have common knowledge.

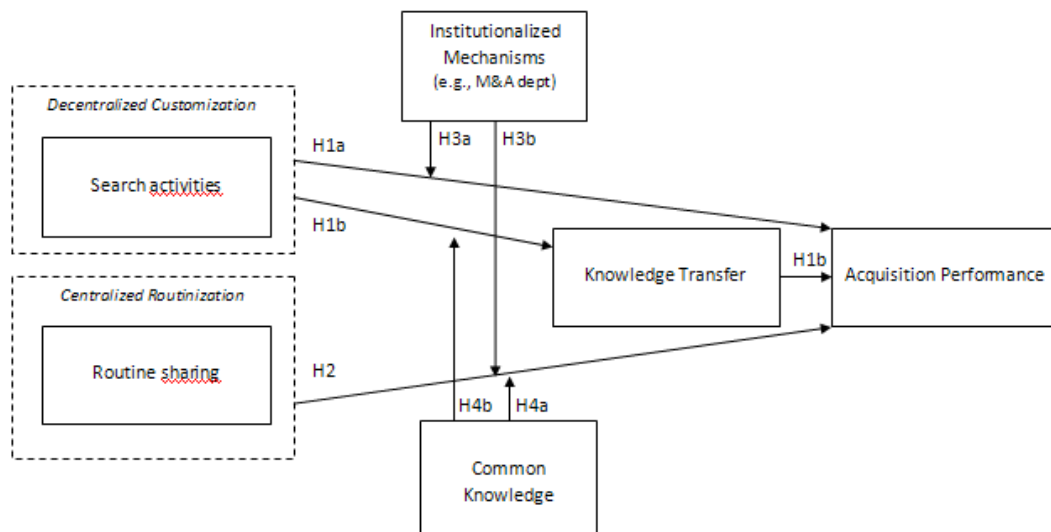


Figure 1 Research Model

*Independent Variables*

*Search activities*

From a behavioral theory perspective, the importance of understanding which activities can enhance learning, how to avoid myopic search given bounded rationality, and thus, how the process of learning unfolds, have been central (Argote & Greve, 2007). Scholars from this tradition have recognized the importance of problemistic search (i.e., ad hoc problem solving) for enhancing learning, which could help avoid myopic search when compared to working according to standard operating procedures. When it comes to grafting, it is about the capabilities based on highly tacit knowledge and skills of the employees that are able to carry out certain activities according to certain procedures. For transferring such highly tacit knowledge and skills, many scholars, whose learning roots could be linked to that of the behavioral theory stream of thought, have recognized the importance of close collaboration during post-acquisition, in order to gain access to the capabilities of the acquired firm (Bresman et al., 2010; Ranft, 1997, 2006; Ranft & Lord, 2002).

To transfer highly tacit knowledge, it is recognized that personal interactions are required (Haas & Hansen, 2007; Hislop, 2009). Engagement in practice in order to enhance learning by actually doing has been advocated by many scholars too (Cook & Brown, 1999; Gherardi, 2000; Orlikowski, 2002; Tsoukas, 1996). Even the founders of evolutionary economics have recognized the importance of observing or being actively trained for transferring such highly tacit knowledge and skills (Nelson & Winter, 1982). Surprisingly, however, strategy scholars, using the evolutionary economics lens, have not done much with the importance of such activities for transferring highly tacit capabilities. Thus, no attention has been paid to what the actual activities are that constitute such observing and active training efforts and what the impact of such activities could be on post-acquisition capability transfer and thus,

acquisition performance. This is remarkable, especially because such activities could be important components of a grafting capability that we seek to understand.

Instead, strategy scholars have been advocating the importance of the routinization of the activities that enhance the transfer of capabilities, in the form of deliberate learning mechanisms, as mentioned earlier (e.g. Zollo & Winter, 2002). However, when it comes to grafting, firms involved are in search of solutions from each other, in order to enhance, for example, their product development efforts, and thus, learn from each other. Given the rapid change in such high-technology environments, where grafting usually takes place, and the post-acquisition integration issues that come along with such grafting activities, there is usually no time and need for routinization of such activities. In addition, routines could create inertia and path-dependency, making such problemistic search even more necessary (Heimeriks et al., 2012; Teece, 2007). Thus, ad hoc problem solving usually seems to be a better plan for acting upon post-acquisition integration issues. This does not mean that there is no routine involved at all. As the director of a company that carries out multiple acquisitions per year mentioned during an interview:

“I think more according to a plan [instead of ad hoc] while being aware of what is happening in the world around us.”

Thus, firms could have a set of search practices that they use to deal with post-acquisition integration issues, such as having meetings or mentoring certain employees, but the content of these activities—and thus, that which such activities actually entail—is being dealt with on an ad hoc basis based on the situation at hand and hence, changes in the environment (e.g. Winter, 2003). In other words, firms decide ad hoc what it is that needs to be dealt with immediately during the meetings or taught to certain employees by means of mentoring practices. Hence, the ad hoc aspect concerns the content instead of the activity being used since firms do have an arsenal of best practices of which they know the use would be beneficial.

Such search practices could be, for example, project teams, job rotation, mentoring, briefing sessions, interviewing experts. These search activities entail a more decentralized customization approach towards acquisition integration, since firms ensure that employees collectively decide what to do next in order to enhance mutual collaboration and thus, capability transfer (Bresman et al., 2010; Ranft & Lord, 2002). In addition, such search activities enhance the overall acquisition performance as well, since the employees get to know each other and start developing social relationships which are beneficial to overall firm performance (Heimeriks et al., 2012). It is by means of such social relationships—enabled by search activities—that employees start developing a new joint social community post-acquisition which ensures that they are willing to collaborate with each other, in order to transfer the capability in question. However, the investment costs for such search activities are higher than those of routine sharing, since search activities require intensive involvement of employees (e.g. Haas & Hansen, 2007). This is because they demand more ‘hours’ to be spent by firms when compared to routine sharing, which we will elaborate on in the next section. On the other hand, Winter (2003) argues that the costs of such activities would be lower if the employees involved carry out these activities on top of their normal routine tasks. In other words, the costs of such search activities would be lower if the employees are not only expected to carry out acquisition-specific tasks and thus, are also able to conduct firm’s normal operational activities. In this case, when there are no problems—concerning capability transfer—to be dealt with on an ad hoc basis, such employees would go on and carry out their own tasks. Regardless of the costs, however, one could expect that for transferring highly tacit capabilities, search activities are more effective than routine sharing, since such capabilities are embedded in firms’ practices and require interaction among employees and thus, learning by doing (e.g. Bresman et al., 2010).

Furthermore, by enhancing interaction among employees while stimulating them to learn from each other how the target’s capability works, search activities ensure that knowledge is being transferred post-acquisition. This knowledge transfer, in turn, is of interest for the acquisition in order to transfer the capability in question and thereby also affects overall acquisition performance. Therefore, given the importance of knowledge transfer for capability-based acquisitions, one could expect that the positive effect of search activities on overall acquisition performance is also because of such activities’ effect on knowledge transfer. Hence, we expect that search activities enhance overall acquisition performance directly as well as indirectly through enhancing knowledge transfer. These arguments lead to the following hypotheses:

*Hypothesis 1a: Search activities have a positive effect on overall acquisition performance.*

*Hypothesis 1b: The positive effect of search activities on overall acquisition performance is*

*mediated by knowledge transfer.*

*Routine sharing*

As mentioned above, an evolutionary economics perspective highlights the importance of routines for the analysis of firm behavior. Scholars in this tradition have focused on intra-firm replication of routines (Szulanski, 1996; Szulanski & Jensen, 2006; Szulanski & Winter, 2002; Winter & Szulanski, 2001), inter-firm replication of routines (e.g., Becker, 2004; Madhok, 1997), or the importance of routinized activities such as deliberate learning mechanisms for enhancing inter- and intra-firm capability transfer (Zollo, 2009; Zollo & Singh, 2004). When it comes to grafting, the focus is on intra-firm transfer of capabilities, since firms involved in such activities aim to access capabilities of the target firm that has become a part of their own organization. Therefore, one could argue that in such contexts coordination mechanisms available for intra-firm activities can be used. Given the context-dependent nature of routines, which makes their replication difficult—indeed, often exceedingly difficult (e.g. Becker, 2004; Madhok, 1997)—firms involved in capability-based acquisitions try to find ways to transfer such routines. One such way is through routine sharing.

Firms oftentimes codify their understanding of internal operational routines in written tools such as manuals, blueprints, decision support systems, repository and retrieval systems, project management software, or even web 2.0 software, which is in line with deliberate learning mechanisms stream of thought, that is, knowledge codification (e.g. Haas & Hansen, 2007; Zollo & Winter, 2002). In order to gain access to capabilities of the acquired firm, an activity that requires minimal costs is to exchange such codified versions of firm's knowledge, an activity that we label here as 'routine sharing' (Enberg, Lindkvist, & Tell, 2006). Given the low investment efforts, firms involved in such capability-based acquisitions oftentimes opt for such routine sharing activities. By doing this, firms involved share their past codification efforts regarding their operational activities with each other. Hence, this approach is based on economics of reuse (Enberg et al., 2006). This is in line with what Grant (1996) calls "giving directions" or what Haas and Hansen (2007) call "exchanging documents." The focus here, however, is more on the fact that such exchange of documents is meant to share the routines, since firms involved in capability-based acquisition are interested in the way the other firm carries out its activities and thus, the capabilities of the acquired firm that are embedded in its routines. This approach by definition entails some form of centralized routinization, since firms try to steer the routines according to which activities are meant to be carried out from the top. The importance of such routine sharing and its impact on acquisition performance, however, has not had much attention.

Given that the capabilities of firms are embedded in their routines (e.g. Allatta & Singh, 2011; Sirmon, Hitt, & Ireland, 2007) and are usually of a highly tacit and causally ambiguous nature (Ranft & Lord, 2002), routine sharing by means of giving directions by definition entails a loss of tacit knowledge (Grant, 1996). Thus, it is expected that the knowledge the acquirer attempts to gain access to through grafting is not likely to be fully shared through routine sharing. As a corporate business development director of a company that carries out multiple acquisitions per year stated in an interview:

Interviewee: "No, let me say it this way: sending reports [and documents] is just not going to be it."

Interviewer: "No? So..you really need that interaction [that you mentioned]?"

Interviewee: "No you really need 'talking' for that."

In other words, firms might have difficulties finding relevant knowledge or acting upon it (Haas & Hansen, 2005, 2007). Therefore, routine sharing seems not to be an appropriate approach for enhancing grafting. On the other hand, however, such routine sharing activities do enhance the 'dating-process'—that is, they do make sure that firms get to know each other's activities faster and thus, enhance the process of getting acquainted with each other's way of working. They do also enable firms to coordinate their activities while not transferring knowledge. As the above mentioned interviewee shared with us:

"That [interaction among employees] goes actually based on the results. Like what have you achieved and how can we subsequently embed that in a new [airplane] engine program, but the knowledge..that still remains with us [and does not get transferred]."

For example, in the case of the above-mentioned quote routine sharing helps firms know how certain activities (e.g., developing a component for a new airplane engine) are being carried out in generic terms (e.g., based on results) and how such activities fit within their own operations (e.g., a new airplane engine program). This, in turn, helps these firms conduct their operations as efficient as possible by not spending much time on transferring the actual knowledge (i.e., what the exact micro-level activities are that lead to developing a certain component for a new airplane engine), but focusing on carrying out their own expertise—while coordinating the interdependencies among all these activities optimally. Thus, routine sharing entails a coordination and efficiency aspect (e.g. Enberg et al.,



2006; Grant, 1996; Haas & Hansen, 2007; Zack, 1999). Hence, one could argue that routine sharing could have a positive effect on the overall acquisition performance. These arguments lead to the following hypothesis:

*Hypothesis 2: Routine sharing has a positive effect on overall acquisition performance.*

*Moderators*

*Institutionalized mechanisms*

It is expected that institutionalized mechanisms such as an M&A department for experience accumulation, post-acquisition assessment for knowledge articulation, and an M&A repository and retrieval system for knowledge codification, have a positive effect on acquisition performance, as mentioned earlier (Amiryany et al., 2012; Barkema & Schijven, 2008b; Helfat et al., 2007; Zollo & Winter, 2002). Such institutionalized mechanisms affect the choice and use of search activities and routine sharing based on firms' past learning that has been captured and accumulated on a corporate level (Amiryany et al., 2012). In other words, institutionalized mechanisms such as an M&A department based on the firm's past experiences, which are partly in other existing institutionalized mechanisms such as an M&A repository and partly a result of knowledge articulation during evaluation sessions, determine which type of search activities and routine sharing to carry out in order to enhance grafting within a specific acquisition. Or as a vice-president of an active acquirer mentioned during an interview:

"Two functions I think sit at corporate level in our company [related to acquisition integration]. So, that is integration leadership and the integration project management office. They go through plans, tasks, mile stones, process and tools, definitions, standards, all that stuff that creates a homogenous integrated [acquisition] project plan."

By helping decide on search activities and routine sharing, institutionalized mechanisms moderate the effect that such search activities and routine sharing have on overall acquisition performance, in a positive way. Institutionalized mechanisms do this by functioning as guidance throughout the post-acquisition integration process. These arguments lead to the following hypotheses:

*Hypothesis 3a: Institutionalized mechanisms amplify the effect that search activities have on overall acquisition performance.*

*Hypothesis 3b: Institutionalized mechanisms amplify the effect that routine sharing has on overall acquisition performance.*

*Common knowledge*

As argued earlier, it is expected that for sharing such highly tacit capabilities as in the case of grafting, search activities are more appropriate than routine sharing. In addition, however, it is expected that the effect of search activities and routine sharing will be strengthened when common knowledge exists (e.g. Ahuja & Katila, 2001; Allatta & Singh, 2011; Argote & Greve, 2007; Hitt et al., 2009; Puranam et al., 2009). First, concerning search activities, having similar knowledge helps firms involved better understand each other such as by using the same jargon, leading to more effective usage of search activities. For example, when involved in brainstorming sessions or mentoring practices, having such common knowledge could help employees to better understand the point of view of the other party and thus, have more effective search activities. In addition, having common knowledge will enhance collaboration among employees, since experts are more willing to collaborate with their peers, leading again to amplifying the effect of search activities and thus, more effective search activities (Allatta & Singh, 2011). Second, the same holds for routine sharing too since when sharing the codified version of routines by means of, for example, manuals, having common knowledge could help employees to be better able to interpret the documents that are being exchanged. This is because, for example, certain codes that are being used in the documents would be obvious for the employees involved since they have some degree of common knowledge. In other words, the existence of common knowledge creates the needed absorptive capacity while decreasing the existing cognitive distance among employees and thus, amplifies the effect of routine sharing (Cummings & Teng, 2003; Lewin, Massini, & Peeters, 2011; Zahra & George, 2002). Hence, knowledge can be more easily assimilated when some degree of similarity exists (Allatta & Singh, 2011). As the director of a company that conducts multiple acquisitions per year mentions during an interview:

"They [experts of the acquired and acquiring firm] are complementary with each other. They can understand each other totally because they talk exactly in the same way and have exactly the same technique, but for totally different industries."

Thus, the existence of some homogeneous elements in the knowledge base of the firms involved in such grafting activities, could help stimulate the grafting process and thus, learning (e.g. Hitt et al.,

2009). These arguments lead to the following hypotheses:

*Hypothesis 4a: The positive effect of routine sharing on acquisition performance is amplified by the existence of common knowledge.*

*Hypothesis 4b: The positive effect of search activities on knowledge transfer is amplified by the existence of common knowledge.*

## 4 Data and Methods

### 4.1 Sample

This study is based on qualitative and quantitative data gathered by a two-phased research design aimed at gaining more understanding regarding the micro practices that enhance post-acquisition knowledge transfer and thus, the performance of capability-based acquisitions. First, we conducted a series of exploratory interviews with post-acquisition integration experts—that is, executives and front-line managers—in 2009, in order to understand their view of the post-acquisition implementation phase and the practices that they use to enhance the transfer of knowledge. These experts had been involved in both successful and unsuccessful acquisitions as well as small and big size acquisitions. Second, the interviews were used as input for the development of a survey in 2010. Subsequently, the survey was sent out to a large number of firms in 2011.

#### *Interviews*

In the first phase of our research, we conducted a total of 17 interviews with executives and front-line managers that were responsible for or involved in, an acquisition implementation process. These executives and managers were from a variety of large and small high-technology firms such as, for example, Cisco, Philips, Getronics, and Teva. These exploratory interviews provided us the needed stimulants for rethinking our perspective on acquisition implementation and thus, gaining a deeper understanding of what such managers are concerned with and how they try to deal with the issues they face when it comes to enhancing the transfer of knowledge and capabilities of an acquired firm. The interviews lasted approximately between 45 to 60 minutes and were semi-structured, containing questions on how the transfer of knowledge actually took place during post-acquisition phase, that is, by means of which practices, and the factors that affected this process. The interviews served as input for the development of our survey.

#### *Survey*

Based on the exploratory interviews, an extensive literature review, and advice from two academic experts, in the second phase of our research we developed a survey containing 17 practices aimed at enhancing grafting and an additional 7 institutionalized mechanisms meant to develop a grafting capability. This approach enabled us to combine existing knowledge in the literature regarding acquisition implementation and the current practices of the high-technology industry, in order to make sure that we could build upon prior research and inform it by the latest practices in the industry. Subsequently, we pre-tested and adjusted the survey based on feedback from one acquisition specialist and three industry experts.

After having refined the survey, the survey was sent out to 649 Cambridge Healthtech Institute (CHI) members with a senior R&D managing position. CHI is a network for leading researchers and business experts in the life sciences, providing conferences, event development and management, and industry reports for the life sciences industry. The life sciences industry—defined by the OECD as a high-technology industry (Hatzichronoglou, 1997)—is an industry with an active acquisition history in which technological learning has been mentioned to be key for gaining a competitive advantage (e.g., Cloodt, Hagedoorn, & Van Kranenburg, 2006; Schweizer, 2005). The senior R&D managers were selected as key respondents because the company that they were working at had been involved in an acquisition during the past five years according to SDC Platinum which is a worldwide M&A database. Using a five-year window allowed us to ask the respondents to reflect on those acquisitions that were still fresh in their memories—while the acquisition effects that we are interested in were visible since the needed time had passed (e.g., Desyllas & Hughes, 2010). Furthermore, given that capability-based acquisitions are meant to get access to the knowledge and capabilities of the acquired firm, senior R&D managers could function as the key respondents. Such senior R&D managers are involved in highly knowledge intensive work and are prominent figures which firms should and do involve in post-acquisition knowledge transfer activities. Thus, by choosing senior R&D managers as key respondents, we ensure that the survey is filled in by those who actually engage in the practices that are of interest for us (Heimeriks et al., 2012; Ray, Barney, & Muhanna, 2004). Therefore, having senior

R&D managers—that have been actively involved in the knowledge transfer process of the acquisition—as our respondents, could be seen as the strength of our study. However, using such single respondents' method could create common method bias. Therefore, while developing our research design we considered a few aspects, in order to avoid such concerns regarding common method bias. First, we assured respondents total anonymity. Second, the independent and dependent variable were psychologically separated, that is, qua proximity and methodology (Heimeriks et al., 2012; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In other words, we measured the independent and dependent variables in different sections of the survey and we used different types of scales. The former makes sure that respondents do not think that the independent and dependent variable are part of the same scale and thus, do not answer them accordingly. The latter, on the other hand, makes sure that respondents have to rethink when trying to answer questions, since the scales differ, and thus, they cannot automatically fill in the answers, which helps avoiding that same answers are given across the survey without thinking whether they are appropriate. In addition, we used a marker variable which is a theoretically unrelated variable, to be able test whether respondents also answered this question accordingly, and thus, were filling in the survey automatically without thinking about the answers (Williams, Hartman, & Cavazotte, 2010). Finally, it has been argued that common method bias makes it difficult to reveal interaction effects (Heimeriks et al., 2012; Siemsen, Roth, & Oliveira, 2010). Therefore, in case there is common method bias in our sample, its impact should be minimal on hypotheses 3 and 4

After sending out the survey, a total of 126 were filled in, being good for a response rate of 19.4 percent. Such response rate has been mentioned to be quite high for surveys that are targeted at senior managers (e.g. Capron & Shen, 2007; Heimeriks et al., 2012). Because of incomplete responses we had to drop 24 surveys, resulting in a total of 102 surveys to work with for the analyses. The resulting 102 responses contained 'I don't know-answers' by a few respondents, that is, less than 10 percent, regarding some variables. For these missing values we conducted an Expectation Maximization approach, since the missing values were missing at random (Little & Rubin, 2002).

The respondents of our survey had in total 181 experiences with acquisitions that had access to new knowledge and capabilities as their motive. The acquiring firms in these acquisitions were in 65 percent of the cases large firms consisting of more than 1000 employees while this was only the case for 46 percent of the acquired firms. On average 26 percent of the acquired firms had even less than 100 employees while this was only the case for 16 percent of the acquiring firms. In addition, approximately 63 percent of the acquiring firms were headquartered in North America and 25 percent in Europe. In case of the acquired firms, approximately 75 percent were headquartered in North America and 12 percent in Europe. All acquisitions took place within the life sciences industry with an aim to get access to new capabilities.

Furthermore, by comparing early and late responses we tested for non-response bias (Armstrong & Overton, 1977). The chi-square of two key variables, that is, acquisition performance ( $\chi^2 = 4.817, p > 0.05$ ) and knowledge transfer ( $\chi^2 = 12.516, p > 0.05$ ), did not show the existence of non-response bias. In addition, for assessing whether common method bias existed within our data, we also carried out a formal procedure once we had the data. By means of Harman's one-factor test we were able to find three distinct factors, all of them having an eigenvalue greater than one, while none of them accounted for a covariance greater than 50 percent, namely: 29.7, 25.4, and 17.3 percent (Podsakoff & Organ, 1986).

#### 4.2 Dependent and independent variables

Table 1 in the Appendix provides detailed information regarding our measurement approach concerning the dependent and independent variables. In line with existing research in the strategy field, we use a perceptual measurement method for our dependent variable (Heimeriks et al., 2012; Kale & Singh, 2007; Zollo et al., 2002). More specifically, the dependent variable acquisition performance was measured by using a multi-item five-point Likert-type scale that focuses on different dimensions of performance, that is, overall performance, financial performance, and innovation performance. Such multi-item measures are generally preferred since they capture more information (Heimeriks et al., 2012).

**Table 1. Measurement of the Variables <sup>a</sup>**

Construct	Measurement
Acquisition performance	“(1) To what extent was (is) your company satisfied with the overall performance of this acquisition (so far), (2) to what extent did this acquisition have a positive effect on the overall innovation performance of the combined entity (so far), (3) to what extent could this acquisition be seen as a success from a financial point of view (so far)?” The variables are measured on a five-point scale: (1) not at all, (2) a little, (3) somewhat, (4) to a great extent, and (5) to a very great extent.

<b>Search activities</b>	<p>“Please indicate if any of the following were used to enhance sharing of knowledge among the employees of the acquired company and your company? (Please note: it is possible to give more than one answer): (1) site visits or tours of the partner company, (2) interviews with experts of the partner company, (3) job rotation (employees get a position in the partner company), (4) mentoring, (5) brainstorming sessions, (6) team-based work design (project teams), (7) briefing sessions, (8) workshops and seminars, (9) training courses or skill development practices, (10) best practice exchange (companies exchange the best processes they have)?” The variables are measured as a sum ranging from 0 = none of the items to 10 = all items in place (e.g., Zollo &amp; Singh, 2004).</p>
<b>Routine sharing</b>	<p>“Please indicate if any of the following were used to enhance sharing of knowledge among the employees of the acquired company and your company? (Please note: it is possible to give more than one answer): (1) electronic forums, (2) exchange of documents, (3) repository and retrieval systems containing information regarding partner company’s knowledge, (4) intranet, (5) groupware technology (e.g., lotus notes), (6) blogs, (7) web 2.0 (e.g., wiki)?” The variables are measured as a sum ranging from 0 = none of the items to 7 = all items in place (e.g., Zollo &amp; Singh, 2004).</p>
<b>Knowledge transfer</b>	<p>“To what extent are the following statements correct: (1) your company has learned a great deal about the knowledge held by the acquiring/acquired company, (2) the acquiring/acquired company has learned a great deal about the knowledge held by your company, (3) the knowledge held by your company has been assimilated by the acquiring/acquired company, (4) the knowledge held by the acquiring/acquired company has been assimilated by your company.” The variables are measured on a five-point scale: (1) Strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, (5) strongly agree (adapted from Simonin, 1999).</p>
<b>Institutionalized mechanisms</b>	<p>“Please indicate if any of the following were used for this acquisition (Please note: it is possible to give more than one answer): (1) acquisition (M&amp;A) department, (2) acquisition (M&amp;A) team, (3) acquisition (M&amp;A) manager (a person responsible for the specific acquisition who watches over the whole process), (4) knowledge integration manager (a person responsible for enhancing the sharing of knowledge among the employees of companies involved), (5) M&amp;A collaboration site (a website accessible for managers from relevant business functions in order to enhance collaboration and guide the acquisition process), (6) acquisition repositories (a database storing knowledge, tools, and processes about acquisitions, which can be used for each new acquisition), (7) post-acquisition assessment (to discuss the lessons learned from this acquisition)?” The variable is measured as a sum ranging from 0 = none of the items to 7 = all items in place (e.g., Zollo &amp; Singh, 2004).</p>
<b>Common knowledge</b>	<p>“Given the overlap of the knowledge of the two companies, the acquiring/acquired company could independently develop the same outputs as your company.” The variables are measured on a five-point scale: (1) Strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, (5) strongly agree (adapted from Cummings and Teng, 2003).</p>

<sup>a</sup> A complete overview of the survey is available from the authors.

For our independent variable ‘search activities’ we sum up a total of 10 practices that firms use, an approach that is in line with existing literature (Heimeriks et al., 2012; Zollo & Singh, 2004). Second, for our independent variable ‘routine sharing’ we used the sum of 7 tools that were adopted by firms. Both of the independent variables measure how many of such practices were used during the acquisition in order to enhance grafting and thus, the performance of such capability-based acquisitions. For ensuring construct validity, we have used both insights from the existing literature as well as from our own fieldwork. Third, the mediating variable ‘knowledge transfer’ was measured by using an adapted version of an existing multi-item Likert-type scale of Simonin (1999). In addition, the moderating variable ‘institutionalized mechanisms’ was also measured by using existing practices that were mentioned in the literature and during our fieldwork and summing those practices up that were used by the firm during the focal acquisition (Barkema & Schijven, 2008b; Zollo & Singh, 2004; Zollo & Winter, 2002). Furthermore, we measured the moderating variable ‘common knowledge’ by using a single-item Likert-type scale, an adapted version of an existing scale of Cummings and Teng (2003). Even though multi-item scales are preferred, single-item scales have been mentioned to capture the needed information too, as long as the construct is specific enough (Heimeriks et al., 2012). Given that this scale only focuses on the similarity of the knowledge of both firms regarding the fact that employees of both firms are able to understand each other, it excludes any other factor that could have an overlap with the broader knowledge of the firm construct and therefore, we believe, it is specific enough to be measured by means of a single-item (Heimeriks et al., 2012).

Finally, an important aspect to note is that our measures of search activities, routine sharing, and institutionalized mechanisms are formative scales. In contrast to reflective scales, using formative scales

means that the items mutually affect and create the meaning of the construct that one wants to measure (Jarvis, Mackenzie, & Podsakoff, 2003). Using formative scales means that the items constituting such scale are not correlated, leading to the standard validity and reliability criteria for reflective scales not being appropriate to validate such formative ones (Jarvis et al., 2003). Therefore, in order to assess the validity and reliability of our formative scales we considered a few aspects, in line with requirements mentioned in the literature (Diamantopoulos & Winklhofer, 2001; Heimeriks et al., 2012). First, we ensured appropriate overall scope, that is, content specification, and that of the specific items, that is, indicator specification, by gaining detailed insights from our exploratory fieldwork and pre-testing the survey. Second, we also ensured content and indicator specification by relying on existing literature. Last but not least, we also conducted an inter-correlation test regarding each scale's items, that is, indicator collinearity, by using Variance Inflation Factors (VIF), which showed that there is no overlap among the items since all VIFs were far below the required threshold of 10. (Neter, Kutner, Nachtsheim, & Wasserman, 1996).

#### **4.3 Control variables**

In addition to our dependent and independent variable, we have also added a few control variables in our research model. These include cross-border acquisitions, hostile acquisitions, acquisition experience, codifiability of knowledge, and the level and mode of the integration. First, cross-border acquisitions are acquisitions within which one of the firms is headquartered in a different country. Such cross-border acquisitions could face more difficulties given cultural differences and geographical dispersion of firms involved. Therefore, controlling for cross-border acquisition could reveal interesting insights. Second, many times acquisitions have a hostile nature which could have consequences when it comes to transferring knowledge and capabilities that are of interest. Thus, hostile acquisitions could create a sense of resistant from the employees of the acquired firms, making it difficult to collaborate. Hence, controlling for such hostile acquisitions could reveal interesting findings. Third, acquisition experience concerns whether or not the firms has been involved in an acquisition before. It could be that firms with acquisition experience are better in solving certain acquisition implementation issues than those without experience. Thus, controlling for acquisition experience seems to be an important aspect for understanding performance variations across acquisitions.

Furthermore, it could be that the knowledge that the firms want to get access to is quite codifiable which makes it easy to transfer such knowledge via documents and manuals and thus, by means of routine sharing. In such cases, one could expect better acquisition performance given that the knowledge that is meant to be transferred is less ambiguous and thus, easier to transfer. Therefore, controlling for the degree of knowledge codifiability could reveal interesting insights too. By asking the respondents to what extent the knowledge in question that was being transferred could be explained in writing, we aimed to assess the codifiability of knowledge. Finally, the level of integration could have an effect on acquisition performance too. It could be that firms using a high level of integration disrupt the knowledge and capabilities of the acquired firm by not giving it the needed autonomy and thus, affecting acquisition performance in a negative way. On the other hand, it could also be that firms use different modes of integration such as on distance and physical integration, that is, virtually integrating the operational activities versus co-locating employees in the same physical space, respectively, in order to enhance acquisition performance. Thus, it could be that firms use a high degree of integration, but do not integrate the companies physically to make sure that the acquired firm has the needed autonomy. Hence, controlling for the level and mode of integration could reveal interesting insights too.

On a related note, for cross-border acquisitions, hostile acquisitions, acquisition experience, and integration mode, a dummy variable is used to capture whether or not the acquisition had a cross-border or hostile-nature, whether or not the firms had acquisition experience, and whether or not physical or on distance integration was used. For knowledge codifiability, however, a single-item Likert-type scale was used which is an adapted version of Levin and Cross's (2004) tacit knowledge scale. Finally, also a single-item Likert-type scale was used for assessing the integration level.

#### **4.4 Analyses**

For testing our hypotheses, we used OLS regression analysis. By mean-centering the non-categorical independent variables, we diminished multicollinearity that could exist due to use of interaction terms (Aiken, West, & Reno, 1991). Furthermore, in order to be cautious regarding our findings, we used two-tailed tests for all significant results. Finally, we used a Sobel test for testing the mediation in our research model (MacKinnon, Warsi, & Dwyer, 1995).

### 5 Results

As depicted below, Table 2 provides the descriptive statistics including the mean, standard deviation, and correlations of the variables of our research model. As shown in the table, the variables are not highly correlated, indicating that multicollinearity should not be a problem. We attempted to confirm this observation by calculating the VIF factors of the explanatory variables and comparing them to a threshold of 10 (Neter et al., 1996). Given that all the VIFs were below this threshold of 10, we could assume that indeed the existence of multicollinearity could be ruled out.

**Table 2 Descriptive Statistics and Correlation**

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
Acquisition performance	3,161	0,950												
Knowledge transfer	3,615	0,788	0,4756*											
Routines sharing	2,078	1,487	-0,133	0,042										
Searching activities	4,118	2,186	0,3204*	0,3545*	0,4966*									
Institutionalized mechanisms	2,157	1,584	0,101	-0,073	0,4066*	0,4406*								
Common knowledge	2,833	1,358	-0,127	-0,101	-1210,000	-0,077	-0,080							
cross-border acquisitions	0,422	0,496	0,064	0,079	0,035	-0,046	0,016	0,002						
Hostile acquisitions	1,137	0,346	-0,339*	-0,245*	0,248*	0,005	0,033	0,049	0,121					
Acquisition experience	2,755	0,432	0,214*	-0,0684	-0,0776	0,1356	0,288*	0,0141	-0,0674	0,0286				
Codifiability of knowledge	9,725	24,374	0,077	-0,063	0,062	-0,021	-0,003	-0,281*	0,001	-0,120	0,068			
Integration level	3,216	1,157	0,378*	0,512*	0,278*	0,393*	0,068	-0,071	0,116	-0,149	-0,131	0,098		
Integration mode physical	0,137	0,346	0,073	0,078	0,152	0,096	0,177	0,134	-0,167	0,007	-0,104	0,116	0,272*	
Integration mode distance	0,304	0,462	-0,061	0,115	0,023	-0,016	-0,160	-0,281*	-0,003	-0,016	-0,020	-0,094	-0,179	-0,264*

\* P < .05

**Table 3 OLS Regression Analyses**

	Hypothesis	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<b>Controls</b>		<b>Acq.Perf.</b>	<b>Acq.Perf.</b>	<b>K. Transfer</b>	<b>Acq.Perf.</b>	<b>K. Transfer</b>	<b>Acq.Perf.</b>
Intercept		2.332351	2.508832	3.815328	2.44434	3.733774	2.40887
Cross-border acquisitions		0.176	0.220	0.156	0.169	0.192	0.225
Hostile acquisitions		-0.764**	-0.599**	-0.216	-0.530*	-0.214	-0.533*
Acquisition experience		0.584**	0.445†	-0.432	0.459*	-0.021	0.479*
Codifiability of the knowledge		0.109	0.048	0.205	-0.017	0.169†	-0.021
Integration level		0.257**	0.223*	0.228**	0.149	0.245**	0.151
Integration mode physical		0.091	0.200	0.151	0.151	0.108	0.180
Integration mode distance		0.002	-0.041	0.257*	-0.124	0.318*	-0.104
<b>Hypothesized Variables</b>							
Search activities	1a & 1b		0.142**	0.099**	0.110*	0.103**	0.117*
Knowledge transfer	1b				0.323*		0.324*
Routine sharing	2		-0.208**	-0.060	-0.188*	-0.075	-0.204**
Institutionalized mechanisms			-0.005	-0.074	0.019	-0.060	0.040
Common knowledge			-0.092	-0.030	-0.082	-0.006	-0.087
Search activities * Institutionalized mechanisms	3a						-0.022
Routine sharing * Institutionalized mechanisms	3b						-0.005
Routine sharing * Common knowledge	4a						0.043
Search activities * Common knowledge	4b					0.043†	
N		102	102	102	102	102	102
Model F-test		12.56	10.56	11.15	12.41	10.77	13.26
R-squared		0.314	0.413	0.462	0.452	0.483	0.464
Adjusted R-squared		0.263	0.342	0.396	0.378	0.413	0.371
† P < .10							
* P < .05							
** P < .01							

The tests of our hypotheses are depicted in Table 3. Model 1 in Table 3 is a baseline specification including only the control variables. Model 2 through 4 include both controls and main effects, whereas model 5 and 6 also include the interaction effects. Model 2 tests hypothesis 1a and 2, that is, the direct effect of search activities and routine sharing on acquisition performance, respectively. Model 2 through 4 test for the mediating role of knowledge transfer concerning the effect of search activities on overall acquisition performance and thus, hypothesis 1b. Model 5 and 6 test for hypotheses 3a, 3b, 4a, and 4b, that is, the moderating role of institutionalized mechanisms and common knowledge, respectively. Concerning the results, first, model 2 shows that search activities have a significant positive effect on overall acquisition performance ( $b = .142; p < .01$ ). Thus, we find support for hypothesis 1a, suggesting that the more the employees engage in ad hoc problem solving activities post-acquisition, the better it is for the acquisition performance. Model 2 also illustrates that routine sharing has a significant effect ( $P < .01$ ) on acquisition performance, but this effect is negative ( $b = -.208$ ). Hence, our findings do not support hypothesis 2 which is that routine sharing has a positive effect on the overall acquisition

performance. On the contrary, our findings reveal that routine sharing even has a negative effect on the overall acquisition performance, suggesting that routines could be interpreted wrongly when transferred in an explicit form by means of routine sharing.

As mentioned above, model 2 demonstrates that search activities are positively related to acquisition performance. However, model 3 and 4 reveal that knowledge transfer partially mediates this effect. First, this is because search activities are positively related to knowledge transfer, as is depicted in model 3 ( $b = .099$ ;  $p < .01$ ). In addition, in model 4 it is shown that search activities remain having a significant effect on acquisition performance ( $b = .110$ ;  $p < .05$ ), but knowledge transfer has a significant effect too, when included in the model ( $b = .323$ ;  $p < .05$ ). Furthermore, the explanatory power of model 4 is quite higher than that of model 2 (Baron & Kenny, 1986). Finally, a Sobel test for mediation confirmed this observation too. Thus, we find support for hypothesis 1b, indicating that the effect of search activities on acquisition performance is partially mediated by knowledge transfer.

The moderating effect of common knowledge and institutionalized mechanisms are tested by model 5 and 6, respectively. Model 5 shows a weak but positive and significant effect ( $b = .043$ ;  $p < .10$ ) regarding the interaction between common knowledge and search activities. Thus, the existence of common knowledge moderates the relationship between search activities and knowledge transfer, suggesting that the more common knowledge the stronger the effect of search activities will be on knowledge transfer. Hence, our findings support hypothesis 4b. Furthermore, model 6 which is the most complete model with acquisition performance as dependent variable, demonstrates that the interaction effect of institutionalized mechanisms and search activities is not significant. The same holds regarding the interaction effect of institutionalized mechanisms and routine sharing. Thus, institutionalized mechanisms do not moderate the relationship between search activities and acquisition performance and routine sharing and acquisition performance, respectively. Therefore, we do not find support for hypothesis 3a and 3b, suggesting that institutionalized mechanisms such as an M&A department do not seem to affect the impact of search activities and routine sharing post-acquisition. In addition, model 6 also illustrates that common knowledge does not moderate the relationship between routine sharing and acquisition performance. Hence, hypothesis 4a is not supported, indicating that the knowledge that is meant to be transferred by means of such acquisitions is probably of such a highly tacit nature that even having common knowledge does not enable firms to transfer it by means of routine sharing.

Furthermore, concerning the control variables most results are in line with previous research. However, we find that the findings regarding the mode of integration are noteworthy. More specifically, our results show that on distance integration mode which entails that employees are not co-located but operational activities are virtually integrated also has a positive effect ( $b = .318$ ;  $p < .05$ ) on knowledge transfer, as it is depicted in model 5. This could indicate that creating interdependency between the firms by virtually integrating their operational activities could also lead to a certain degree of interaction which is beneficial for knowledge transfer.

#### **Supplementary Analyses**

In order to check for the robustness of our findings, we conducted a few additional tests. As mentioned in the literature section, prior research has highlighted the importance of size for acquisition performance. However, given that our sample is relatively small we did not add size as a control variable in our models, in order to avoid overfitting the models. Nonetheless, as part of our robustness checks we reran the models while adding size as a control variable. The results of this analysis showed that size is not significant. The inclusion of size in the models also did not lead to any major changes of our earlier results and thus, our results were qualitatively identical. Hence, this confirms once again the validity of our findings. In addition, we also reran the models while excluding all control variables in an attempt to decreasing the probability of overfitting the models. The results of this additional analysis also did not reveal any major changes in our findings. Thus, this analysis once again confirms the robustness of our findings.

## **6 Discussion**

In this present paper, we have built on existing literatures on learning, provided by strategy and organization theory scholars, in order to understand how organisational learning through grafting can be enhanced, and thus, how firms can learn to graft—that is, build a grafting capability. Based on the existing literature, we conceptualized such grafting capability as being constituted by institutionalized mechanisms which are meant to deliberately enhance learning (Barkema & Schijven, 2008b; Zollo &

Singh, 2004; Zollo & Winter, 2002). We did, however, probe a few questions, that is, whether such institutionalized mechanisms have a positive effect on post-acquisition process and if so, what should such institutionalized mechanisms advice and contain to enhance learning. Based on our fieldwork and an in-depth survey, our findings reveal that institutionalized mechanisms do not have a positive effect on the post-acquisition process. Thus, the question that remains is, how firms, then, should enhance learning when involved in grafting, and thus, what the microfoundations of a grafting capability should be.

Our findings demonstrate that the most important aspects that enhance grafting are the existence of common knowledge and the use of search activities. On the one hand, knowing that the existence of common knowledge enhances capability transfer enables firms to identify which targets to acquire and thus, focus on the right targets with which they have some overlap in knowledge, in order to increase their odds of success (e.g. Ahuja & Katila, 2001; Allatta & Singh, 2011; Argote & Greve, 2007; Hitt et al., 2009; Puranam et al., 2009). On the other hand, only knowing whom to acquire is not enough since firms still need to be able to adequately transfer target's capability post-acquisition and thus, build a grafting capability. In doing this, our findings show that search activities are vital (Bresman et al., 2010; Ranft, 1997, 2006; Ranft & Lord, 2002). In other words, the most important microfoundations of a grafting capability seem to be search activities.

Given the highly tacit nature of the capabilities that are meant to be transferred by means of capability-based acquisitions, having search activities that enhance collaboration among employees while searching together for solutions, is key for transferring capabilities post-acquisition. This is because such capabilities are often in the heads of employees and embedded in their routines and social relationships, and thus, embedded in practice (Birkinshaw et al., 2000; Bresman et al., 1999, 2010; Ranft & Lord, 2002; Schweizer, 2005). Search activities, by enhancing collaboration and interaction, while being focused on the actual practices of the employees in question, enable employees to start solving problems together on an ad hoc basis, based on the situation at hand and thus, the changes in the environment (e.g., Winter, 2003). By doing this, employees start learning from each other the complexity of the capability in question and the way that specific activities are being carried out by the other firm. In other words, it is learning-by-doing in the actual practice that enables these employees to learn from each other, leading to the transfer of the capability in question (Cohen, 2007; Cook & Brown, 1999; Gherardi, 2000; Orlikowski, 2002; Tsoukas, 1996).

In addition, this learning-by-doing by means of search activities takes place when employees start building relationships and trusting each other, and thus, build the needed social relationships to be willing to collaborate. Search activities, by involving face-to-face interaction enhance the development of social relationships among employees and thus, social integration. Creating the needed social relationships for collaboration is what leads to the development of a new joint social community post-acquisition that stimulates capability transfer. The development of such new joint social community is mentioned to be vital for value creation post-acquisition—when involved in capability-based acquisitions (e.g., Birkinshaw et al., 2000; Bresman et al., 1999, 2010; Puranam et al., 2006; Verbeke, 2010).

Finally, our findings show that even when firms choose not to physically integrate the acquired firm and thus give it the needed autonomy, virtually integrating the acquired firm's operational activities on distance enhances acquisition performance too. In other words, it seems like even if it is only virtual integration, as long as the interdependencies among the firms are increased and thus, also interaction among the employees, the effects will be beneficial for acquisition performance. Hence, it could be that virtual integration also enhances social integration, to a certain degree, and therefore also capability transfer.

### **6.1 Theoretical contributions**

By synthesizing two streams of research on post-acquisition integration—that is, grafting through acquisitions and acquisition capability development—we conceptualized a distinct type of acquisition capability for capability-based acquisitions, namely: a grafting capability, in an attempt to understand how firms can enhance learning through grafting and thus, what the microfoundations of a grafting capability are. By doing this, our research, we believe, offers a number of theoretical contributions.

First, our study addresses recent calls for more research on the microfoundations of capabilities in general (Felin, Foss, Heimeriks, & Madsen, 2012) and knowledge sharing processes in particular (Foss et al., 2010). More specifically, our research addresses recent calls for empirically testing the effect of deliberate learning mechanisms such as an M&A department on post-acquisition performance (Amiryany et al., 2012; Barkema & Schijven, 2008b; Helfat et al., 2007), in order to find out whether



such institutionalized mechanisms could function as the microfoundations of a grafting capability. In an attempt to contribute to existing research, we have tested the effect of such institutionalized mechanisms. Our paper so far, has shown that the existence of institutionalized mechanisms does not affect post-acquisition performance. Therefore, in line with recent research, our findings reveal that routinization on a corporate level is probably not the answer when it comes to developing a grafting capability (e.g., Barkema & Schijven, 2008b; Schijven & Martin, forthcoming). In other words, it could be that firms' learning regarding acquisition integration is not captured at corporate level. Second, our research reveals that deliberate forms of organisational learning by means of routine sharing also do not enhance learning through grafting—in fact, they even harm performance (e.g., Enberg et al., 2006; Haas & Hansen, 2007; Zollo & Winter, 2002), suggesting that a centralized approach towards the use of routines for enhancing learning through grafting does not work too. Third, the findings of our study suggest that the microfoundations of a grafting capability are search activities (Bresman et al., 2010; Ranft & Lord, 2002), which are more effective when firms involved have some degree of common knowledge (Ahuja & Katila, 2001; Allatta & Singh, 2011; Puranam et al., 2009). Search activities stimulate interaction among employees in their actual practice while enabling them to conduct problem-solving activities on an ad hoc basis, based on the situation at hand. By means of such interactions, search activities enhance the development of social relationships among employees and thus, a new joint social community post-acquisition which enables capability transfer (Birkinshaw et al., 2000; Bresman et al., 2010; e.g., Puranam et al., 2006; Verbeke, 2010). Building a new joint social community has been mentioned as being the single most important dimension of capability-based acquisitions' success (e.g., Birkinshaw et al., 2000; Bresman et al., 2010; Verbeke, 2010). Having such new joint social community enables employees to have a mutual practice in which they all are involved, which is of utmost importance in order to understand how the target's capability functions and thus, be able to learn from one another (e.g., Levina & Vaast, 2005).

Indeed, our theory and results suggest that when it comes to learning through grafting, firms need to take into account the specific practices that have enabled the target to create its capability in the first place. This is because, firms involved in capability-based acquisitions want to know how the target carries out certain activities and why, which can only be done by being involved in the actual practice and having face-to-face interaction. In other words, firms involved in capability-based acquisitions are in search of target firm's past learning and thus, the trial and error process that it has been through that enabled it to build its capability. It is in practice—by means of search activities—that firms can do this (Cohen, 2007; Cook & Brown, 1999; Gherardi, 2000; Orlikowski, 2002; Tsoukas, 1996). Thus, our findings demonstrate that the importance of actively training and being involved in practice in order to transfer highly tacit capabilities—as mentioned in the seminal work of Nelson and Winter (1982)—should be taken into account by strategy researchers, when aiming to gain more understanding regarding the microfoundations of a grafting capability.

Finally, being involved in practice while enhancing learning by using search activities means that firms' knowledge related to acquisition integration is—for a great part—distributed within the firm among core knowledge workers. This is because core knowledge workers know how they can learn from each other optimally, given a certain situation, in order to transfer the capability in question. Therefore, our study partly reorients existing research on post-acquisition capability development by illustrating that the role of firm's core knowledge workers might extend far beyond that which previously has been thought.

## **6.2 Managerial implications**

What do our findings mean for firms involved in capability-based acquisitions? What should managers responsible for such grafting events do in order to improve such event's performance? Given that research on acquisitions has shown that acquiring a firm does not guarantee successful grafting (e.g. Bresman et al., 2010; Heimeriks et al., 2012; Ranft & Lord, 2002), knowing how to enhance grafting could help acquirers improve their odds of success. In line with this, first, we have shown in this study that in order to enhance grafting, firms should not rely on institutionalized mechanisms that are meant to deliberately enhance learning top-down. Thus, it seems that having, for example, an M&A department, does not mean that lessons learned from the past—at corporate level—are applicable to current events and thus, having such department does not increase the odds of success of future events. Therefore, post-acquisition integration managers should be aware that firm's acquisition integration experience is, for a great part, captured elsewhere within the firm (e.g., Barkema & Schijven, 2008b; Schijven & Martin, forthcoming).

Second, routine sharing which seems an efficient way of sharing existing knowledge, does not

improve acquisition performance too. Hence, managers involved in such acquisitions should be aware of the fact that there is more knowledge of importance than just that which such written tools capture (Cook & Brown, 1999; Haas & Hansen, 2007). More importantly, practitioners involved in such settings should be aware of the fact that routine sharing could even harm acquisition performance, since such activities even have a negative effect on overall acquisition performance. This is probably because such complex routines are interpreted wrongly when transferred by means of documents, leading to harming performance instead of being beneficial.

More specifically, our study shows that in order to enhance grafting, firms need to invest in search activities such as project teams, job rotation, mentoring, briefing sessions, and interviewing experts. These search activities stimulate interaction among employees and enhance the development of social relationships and thus, a new joint social community post-acquisition (Birkinshaw et al., 2000; Bresman et al., 2010; Ranft & Lord, 2002). For developing a new joint social community, involvement in the actual practice of experts has been mentioned to be vital (Levina & Vaast, 2005). Therefore, managers responsible for acquisition integration should not underestimate the effect of such search activities for developing a grafting capability. Search activities, on average, require more investment since they demand more effort and involvement from the side of the employees. However, such investments do not go without paying off, since investing in such search activities improves acquisition performance and thus, leads to higher returns.

Furthermore, managers involved in capability-based acquisitions should take into account the importance of having common knowledge when searching for new targets, since acquiring firms that have a common knowledge base increases the effect of search activities and thus, acquisition performance. Finally, our study has shown that virtual integration enhances knowledge transfer too. Therefore, given that acquirers usually need to retain target's autonomy, post-acquisition managers could consider to at least virtually integrate the companies, as a means to stimulate capability transfer. This is because such virtual integration increases the interdependencies among the firms, leading to more interaction between the employees and therefore, enhances capability transfer.

#### Limitations and Suggestions for Future Research

Regardless of our efforts and careful considerations, our study also has several limitations. First, our data consists of a small sample size. Despite of the extensive qualitative fieldwork that we have done in order to elaborate on the findings, it could be that larger sample sizes reveal other findings. Therefore, a task for future research is to test our findings with a larger sample size, in order to be able to generalize the findings, perhaps even in a different context—for example, other types of acquisitions and other industries. Second, our data includes single respondents per firm and therefore, also the chance of the existence of common method bias, even when we have tried to avoid this as much as possible. Future research, including multiple respondents per firm, could offer more robust evidence of our findings.

Furthermore, throughout this paper we have argued for the importance of search activities and a decentralized approach towards acquisition integration and thus, for developing a grafting capability. As mentioned earlier, the division of routines versus search activities for enhancing organisational learning, has been shown to be evident from organisational learning's early inception, that is, the roots of organisational learning that go back to a behavioral theory of the firm and evolutionary economics theory. Our findings have shown that search activities, advocated by behavioral theory scholars, are more effective for enhancing learning when involved in grafting and thus, for developing a grafting capability. The importance of such search activities for transferring highly tacit knowledge and skills, has been mentioned by the founders of evolutionary economics too (Nelson & Winter, 1982). Nevertheless, strategy scholars with a strong link with the evolutionary economics theory have not paid much attention to the importance of such search activities and of being involved in practice, for transferring highly tacit capabilities. However, putting the focus on the importance of such search activities for developing certain capabilities such as that of grafting would be a good step forward that could be taken into account by future research and strategy scholars in particular, in order to be able to enhance our understanding regarding organisational learning through capability-based acquisitions.

More specifically, when using such search activities the content of the activity itself is being dealt with on an ad hoc basis and thus, in a non-routinized way. Strategy scholars conducting future research could ask themselves how much non-routinization is non-routinization enough? Thus, how flexible should such search activities be? Addressing these questions could reveal interesting insights. Furthermore, in general, revealing answers for these questions is fundamental since organizations by definition try to formalize and standardize and thus, routinize their activities in order to control such

activities and gain benefits on efficiency aspects. Hence, future research interested in the field of strategy and organization theory should reveal, given the organisational desires, what would the best way of developing such grafting capability be, in order to be able to enhance learning through acquisitions and thus, acquisition performance.

On a related note, it is surprising that institutionalized mechanisms do not affect acquisition performance. Throughout this paper we have argued that firm's acquisition experience is probably captured by the experts involved in practice and thus, not by corporate. This has some implications for future research since researchers need to focus on a different level of analysis when trying to understand where firm's learning through acquisitions is taking place. Our findings demonstrate that this level of analysis is the practice of the actual employees that have created target's capability in the first place (Cohen, 2007; Cook & Brown, 1999; Gherardi, 2000; Orlikowski, 2002; Tsoukas, 1996). Future research should reveal how capability development in practice takes place and thus, what the actual micro-level activities are that enable such experts to develop a grafting capability.

## 7 Conclusion

Regardless of the increasing number of capability-based acquisitions in high-velocity environments and the high failure rates of such acquisitions, we still do not know how to enhance the process of learning through grafting and thus, how to improve these acquisitions' performance. One thing that all scholars would agree upon would be that it is about having a grafting capability which ensures that the acquirer is able to carry out such acquisitions successfully. However, what the microfoundations of such grafting capability should be, has been unclear to date. In this present paper, our attempt has been to unravel the microfoundations of such grafting capability. Surprisingly, in contrast with the existing literature on capabilities that focuses more on deliberate learning mechanisms, our findings have shown that in order to enhance learning through grafting, firms should engage in search activities and thus, ad hoc problem solving. In addition, in order to improve the odds of success, having firms involved in such capability-based acquisitions that have common knowledge, could increase the effect of such search activities too. By conducting this study, we hope to have contributed to the strategy field and more specifically that of organisational learning, by revealing that learning highly tacit capabilities requires intensive collaboration and ad hoc problem solving, aspects that cannot be taken into account by routine sharing and institutionalized mechanisms, only.

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## Research on Cross-cultural Conflicts and Cross-cultural Management in International Business

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**Abstract:** With the development of economic globalization, transnational corporations gradually become the main carrier in world economic globalization and internationalization. The problems of cross-cultural conflicts and cross-cultural management arise along with the rapid increasing of international business. This paper, on the basis of Hofstede's theory of cultural dimensions, focuses on the differences and problems and issues relating to the effective management of different cultures in international business. Then, the paper analyzes the causes of cross-cultural conflicts and cross-cultural management between different cultures and some solutions to cross-cultural conflicts and integration in international business are put forward.

**Key words:** Cross-cultural management; Cross-cultural conflict; Transnational corporation; International business

### 1 Introduction

With the development of economic globalization, transnational corporations gradually become the main carrier in world economic globalization and internationalization. In order to achieve the optimal allocation of global resources, more and more multinational corporations invest their money in different countries. Joint ventures in China flourish and Chinese enterprises enter into the world markets to seek greater opportunities of development. International business is developing rapidly and the influences of cultural differences on the multinational business are various.

In one survey of the global business enterprises on the issue of "what is the business barrier in doing business in the world market?" in the famous American magazine *Electronic world*, cultural differences ranked first in all eight items including law, regulation, price competition, information, language, communication, foreign exchange, the jet lag and cultural difference. The research indicates that the main failure of multinational corporations is the result of ignoring the cultural differences. Cultural differences play a significant role and have great influence on the allocation of resources, system decision, interpersonal relationship, organizational, communications and incentive of leadership behavior. This shows that attaching importance to the cultural differences and conflicts and conducting cross-cultural management has become one of international operation strategies of the enterprises in international business.

### 2 Literature Review of Culture and Cross-Cultural Management

With the process of globalization, especially the increasing of global trade, it is unavoidable that different cultures meet, conflict, and blend together. In international business people from different cultures find their communication is affected by language barrier and culture styles as well.

Culture is ubiquitous, multidimensional, complex, and all-pervasive, which makes it hard to be defined. Different definitions reflect different theories for understanding, or criteria for valuing human activity. Among the over 200 definitions of culture, Hofstede's definition of culture and cultural dimensions are the most widely adopted theories in cross-cultural management studies. "Culture is like a kind of software in mind. A person's thinking pattern, feeling, and acting are programmed by it."(Hofstede, 2005) He defines culture as the collective programming of the mind which distinguishes the members of one human group from another. Moreover, he surveyed over a hundred thousand workers on work goals and values in subsidiaries of IBM in 53 nations and regions. Hofstede divided culture into five dimensions: individualism versus collectivism, uncertainty avoidance, power distance, masculinity versus femininity. Long versus short term orientation is the fifth dimension that Hofstede added in the 1990s after finding that Asian countries with a strong link to Confucian philosophy acted differently from western cultures. He argues that the dimensions of culture can be described as a



society's time horizon or, the importance related to the future comparing with the past and present.

On the basis of Hofstede's theory of cultural dimensions and the careful analysis of a large database of cultural statistics, this research focuses on the differences and problems and issues relating to the effective management of different cultures in international business. This paper analyzed correlation data of the government performance management in western countries and cultural dimension in China (See Table 1). It is worthwhile to point out that this table made a comparison of western countries and China in five cultural dimensions.

**Table 1 Correlation Data of the Government Performance Management in Five Cultural Dimensions**

country	Individualism (IDV)	Power Distance index(PDI)	Uncertainty Avoidance index(UAI)	Masculinity (MAS)	Long -term orientation (LTO)
America	91	40	46	62	29
United Kingdom	89	35	35	66	25
Canada	80	39	48	52	48
New Zealand	79	22	49	58	30
Australia	90	36	51	61	31
China	20	80	30	66	118
Average	43	55	64	50	45

It indicates that cultural difference is tremendous to the different countries and regions in five dimensions. In addition, culture influences people's way of thinking and behaving and as a result it leads to different understandings of cross-cultural communication and cross-cultural management in international business. It is obvious that people from different cultures use different styles of cross-cultural communication. Multi-culture difference will greatly influence the management of transnational corporations. Transnational corporations are bound to be confronted with unprecedented challenges because of different cultural backgrounds they belong to. Conducting effective cross-cultural management is the prerequisite and guarantee of the successful commence and cross-cultural communication.

Cross-cultural management is the management of people and things that involve a different culture background. Formed in America in late 1970s, cross-culture management mainly focuses on the behavior of people from different culture working together as a group or an organization (Adler,1983). Cross-culture management is a scientific study on how to overcome conflicts of the heterogeneous culture and actualize effective management. Most of cross-cultural management studies aim at dealing with the issue of organisational behavior, such as leadership style, motivational approaches, strategy, organisational structure. In short, cross-culture management refers to manage the people, thing and business of different cultural background.

### 3 Causes of Cross-Cultural Conflicts

The problems of the cultural conflicts of cross-cultural communication and cross-cultural management arise along with the rapid increasing of international business. The fusion and conflict of different cultures are imposing great influence on international business management, which is a severe problem that is always there but has frequently been neglected. The neglect of cultural conflicts, in most cases, results in great losses to a company. Such cases are countless in international business. According to the recent research the failure of approximately 35%-45% international joint ventures results from the ignorance of the impact of cultural differences in international business. To recognize the causes of cross-cultural conflicts is the prerequisite of the successful cross-cultural management. The main reasons which lead to cross-cultural conflicts in multinational business enterprises are: racial superiority, inappropriate management habits, misunderstanding of communication and the different values etc.

#### 3.1 Racial superiority

Racial superiority means that some people think their own race is superior to other races and their own cultural value system is superior to other cultural value systems. They are unwilling to accept the different ways of life, thinking and management mode, etc. Or while they are willing to accept or adapt to other cultures, they lack of deep understanding of the people and the heterogeneous cultures, they always have a sense of pride and superiority.

#### 3.2 Inappropriate management habits

The management mode which has been proved to be effective in a cultural environment is not necessarily effective in another cultural environment-this has become a cross-cultural management consensus. There is no mold that can be applied everywhere in this world. Because of the lack of understanding of other cultures and other management modes, some managers of the enterprises insisted on their own management mode. Regardless of other cultures, managers failed to set up the coordinative systems of mutual understanding and trust towards each other. The sound management should be adapted to different cultures according to different times, different places and different people.

### **3.3 Communication misunderstanding**

Communication refers to the process that people convey thoughts, emotions and share information communication in individuals and groups in order to set goals with certain symbol carriers. However, because the different people of different cultures have different views of time, space, customs, habits and view of values as well, they have different ways of communication verbally and nonverbally, which deepens the difficulty in their communication or leads to misunderstanding.

### **3.4 Different values**

Value is a kind of judgment, lasting beliefs of a person or society to a particular social behavior or state of being. With relative stability and continuity, it neither changes all the time nor remains rigid. Values include three parts: cognitive components such as life outlook and world outlook, emotional elements and behavior component. Cognitive components and emotional components influence and determine behavior components of the values. Behavior components of the values are determined by cognitive components and emotional component. The people coming from different cultural background have different values and their behavior and attitudes are different. The different cultural values lead to different patterns of behavior and attitude. In American culture, individualism is the strong power which encourages people to accomplish things. Personal performance is considered to be the most valuable. In contrast, the values of consistency and cooperative of the group of consistency is much greater than the individualism.

## **4 Cross-Cultural Management in International Business**

Achieving effective communication is a great challenging and rewarding task to managers worldwide. Most of the international business are operating on many different business areas and with several product groups and operates on markets in several countries. They must overlap both national cultures and business cultures. Therefore, how to conduct effectively cross-cultural management has become an important issue to face for multinational corporations and joint enterprises in international business.

The influences of cultural conflicts on multinational business enterprises are various. The core of the multinational business management is to solve the cultural conflicts in the management process, to find the objectives of the company beyond the cultural conflicts and to sustain the codes of the employees from different cultural backgrounds. Canada's famous cross-cultural management scholars Nancy J. Adler put forward three kinds of strategies: beyond, compromise and synergy.

Method of beyond should be avoided in solving the cultural conflicts in multinational business. Although it may form a "no conflict unified organization culture" in a short period of time, people of different cultures can't learn from each other. Furthermore, since the cultures of other people are suppressed, it is likely for the people of other cultures to show a strong dislike to different cultures and eventually it leads to intensified conflicts. On the other hand, method of compromise is undesirable, because crises often lurk behind this kind of harmony and stability. Only when the cultural conflict between them is small, can the method of compromise be taken.

Cultural integration refers to the process of combination and mutual absorption between the different forms of culture and cultural characteristics. It takes the assimilation of culture or mutual induction as its symbol. In the process of integration, all kinds of cultures change each other. The infiltration and mutual combination of different cultural characteristics finally becomes one as a whole. The cultural integration embodies the identity of the culture differences; the identity will promote harmony and make it develop interdependently. Still it can gather strength to make the culture differences integrate each other, which is beneficial to their development.

Collaboration is the optimal way to solve the cultural conflicts in international business.

### **4.1 Admitting cultural differences**

On the premise of admitting cultural differences, cultural communication and fusion is the key to the resolving cultural conflicts. Different nationalities have different values, legal systems, thinking

modes and moral standards. A joint venture enterprise is a complex of different ethnic groups. To find a balance point for the conflicts coming from different cultures, the point is that people who are involved in cultural communication and cross-cultural management should understand both themselves and their counterparts. As long as both parties of the corporations are highly aware of mutual communication and frequently exchange ideas, then the conflicts can be solved and an agreement can be reached. Otherwise, the old conflict has not been solved and new problems arise.

#### **4.2 Recognizing cultural differences**

Cultural conflicts are caused by cultural differences. Therefore it is necessary to recognize and analyze cultural differences. Obviously, culture conflicts and differences produced by different culture and criterions are different in degree and styles. When culture differences are recognized, we can integrate them then. The managers in cross-cultural multinational corporations must recognize and integrate culture differences so as to apply proper measures. It has been proved by many facts that avoiding cultural conflicts only keep conflicts piling up. As cultural conflicts exist objectively, we should recognize the inevitability of the cultural conflicts and treat different cultures equally with respect. And some scientific methods should be adopted to identify the different enterprise cultures and analyze the causes of conflicts in order to find out the methods of resolving cultural conflicts.

#### **4.3 Setting up cross-cultural training system**

It is necessary for transnational corporations to set up a sound cross-cultural training system and take it as a long-term strategy, which will help the enterprises to set up learning organization and operate cross-cultural management to attract and retain the talents. It is advisable for the managers of different cultures to communicate each other actively and to implement cross-cultural training. Cross-cultural training helps to strengthen the reaction and adaptability of the people from different cultures towards tradition and promote communication and understanding between the people of different cultures. Generally speaking, the main contents of the cross-cultural training include:

- 1) understanding of the culture of the parent country and the host country;
- 2) cultural sensitivity and adaptation training;
- 3) language training;
- 4) cross-cultural communication and conflict processing capacity training;
- 5) environmental simulation.

#### **4.4 Following the common market rules**

In international business activities, the enterprises from other countries have a set of business operation norms suitable for their own business. But in reality, there is a conventional international practice. In order to make cooperation successful with mutual trust and mutual understanding, a mutual recognition relationship condition, such as a mutually acceptable market communication protocols between each other must be clear. Although in the actual intercourse, it is very hard to avoid those differences in the association with the conditions of the market, the common market rules can be regarded as a series of countermeasures for the partners to make up for the cultural differences in the cooperation.

#### **4.5 Creating the mutual enterprise spirit**

Because of the tremendous cultural differences between different countries, transnational corporations cannot be seasoned with the operating environment in the host country in a short time. It is advisable for transnational corporations to create the mutual enterprise spirit in the way of coupling hardness with softness, not only keep the mutual enterprise spirit in the mind of the stuff but also make sure the stuff act it. In this way, the harmony and localization of cross-cultural management can be realized. Transnational corporations should set up common values system which is beyond their own one to realize the share and compliment of the cultural resources. Transnational corporations also should promote and update the mutual enterprise spirit through information channels such as newspaper, magazine, internet, conference and so on to enhance the cohesion, centripetal force and the power inside the enterprise, which will minimize the adverse impact of cultural conflicts.

## **5 Conclusion**

Cultural difference, existing objectively, is a kind of inevitable phenomenon in cross-cultural communication and cross-cultural management. Therefore, it is unable to avoid by any multinational enterprises. Multi-culture difference greatly influences the management of transnational corporations. Transnational corporations are bound to be confronted with unprecedented challenges because of different cultural backgrounds they belong to. Conducting effective cross-cultural management is the

prerequisite and guarantee of the successful commence and cross-cultural communication. The transnational corporations should utilize cultural resources and integrate their respective advantages together.

History and reality have witnessed that the mutual assimilation and blending of different social cultures are destined to become the main stream. Having a correct understanding of native culture and foreign culture differences and striving to promote the integration of different cultures to eliminating management conflicts are of great significance to promote the development of the transnational corporations in the international business.

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## **Analysis and Application of Profit, Volume and Continuity Model (PVC) in Enterprise Management\***

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**Abstract:** Based on profit, volume and continuity three-dimensional model (PVC), this paper analyzes main elements of financial and business process in the management of fashion enterprises through case study. It lays down the strategic goal for enterprises according to their current situation together with internal and external environment and makes causal analysis between enterprise performance (competitiveness) and PVC system. This paper attempts to provide sustainable managerial solution for fashion enterprises and enhance their market competitiveness.

**Key words:** Profit; Volume and continuity three-dimensional model (PVC); Luxury market; Enterprise management; Evaluation

### **1 Introduction**

In traditional enterprise management theory, the operating strategy is considered a planning process. Models usually used in developed countries include: Ansoff Product-market expansion grid (current product, new product, current market and new market, the four factors make up different kinds of enterprises' strategies), Michael Porter's Five Forces Model (threat of entrance, threat of substitute, challenge from opponent, the bargain ability of buyer and supplier), 4Ps, and SWOT. However, the models or theories above are mainly plan analyses and do not have a very close relationship with the financial performance of a company. So they are not efficient enough in evaluating the current situation of a company as a whole and predicting the future trends.

### **2 The Brief Conception of Profit, Volume and Continuity Model (PVC)**

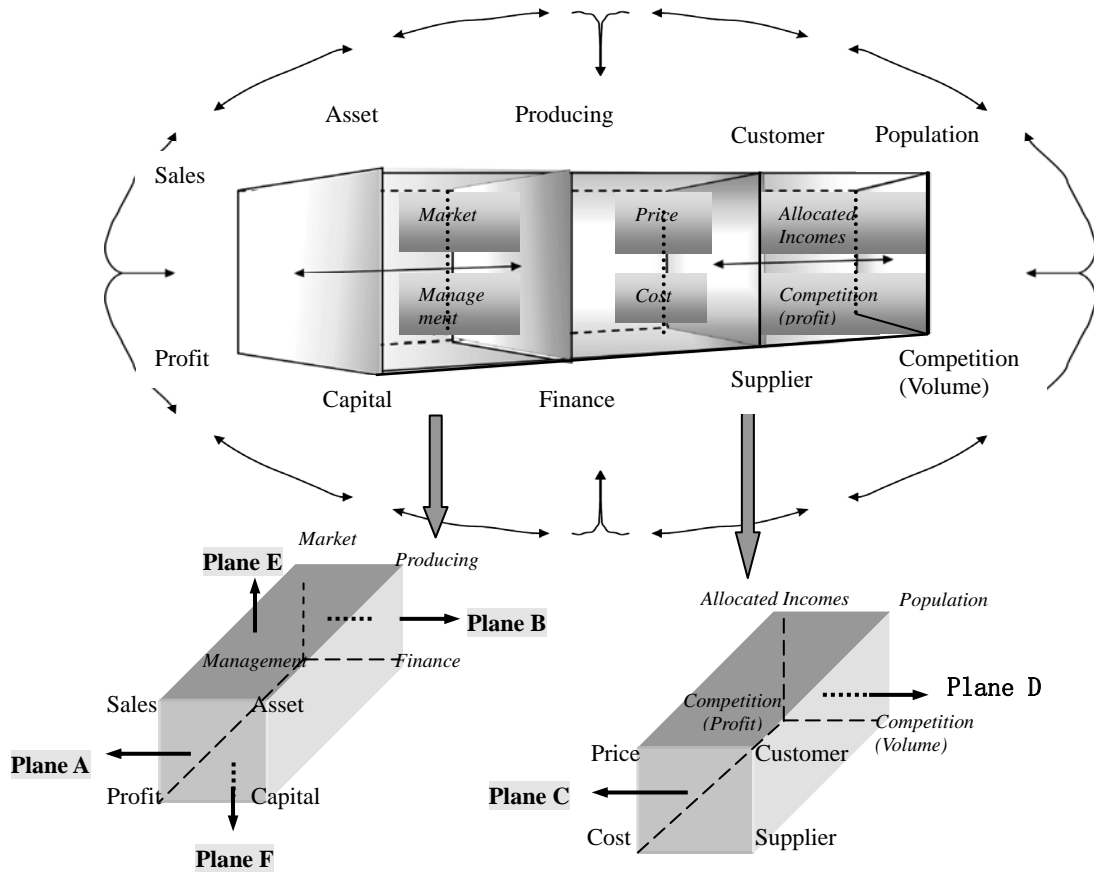
Figure 1 shows the profit, volume and continuity three-dimensional model (PVC) <sup>[1]</sup>. The cause-effect chain connects not only four factors in one plane but also all the planes as well. PVC is used as a compressive method to analyze the company combined with the financial performance, which can help to discover problems and solve them in an efficient way.

In PVC model, P stands for profit, V stands for volume, and C stands for Continuity.  $P \times V$  (PV) makes the profit performance of firm in a period of time. If PV is positive, the company can develop continuously. PVC model synthesizes the basic factors of enterprises' management and expresses it in a three-dimensional way.

PVC can evaluate the managing achievement of a company. It contains three parts: the performance analysis, environment analysis, and strategy formulating. In the paper, plane A and its cause-effect chains are cited as a sample of making the performance analysis for an enterprise.

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Plane A—Financial Performance; Plane B—Resource Distribution; Plane C—Micro-Market Environment; Plane D—Macro-Market Environment; Plane E—Cause-Effect Chain; Plane F—Cause-Effect Chain

**Figure 1 PVC Three-dimensional model**

### 3 PVC Model and Performance Analysis

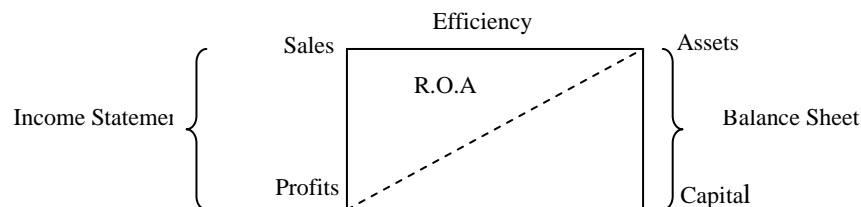
#### 3.1 Financial analysis

Figure 2 shows the financial performance that is the plane A in PVC model. The income Statement is displayed on the left (Profit/Sales), while the balance sheet is displayed on the right (Capital/Asset). The diagonal line connecting Sales and Asset represents Asset managing efficiency, while the other represents Capital return.

PVC financial analysis clearly presents lots of information in one plane, which makes it easier to see through the financial performance of a company.

#### 3.2 Managing efficiency analysis

In financial performance analysis, four functional costs represent resource distributions of a firm. In the system of PVC, the management means the methods used by the entrepreneur and the efficiency after, including the asset, market and finance.



**Figure 2 PVC Financial Analysis (Plane A)**

##### 3.2.1 Asset efficiency

Asset efficiency can be used to evaluate the relationship between the manufacture cost and sales and assets. It is presented by the capital turnover rate.

### 3.2.2 Market efficiency

Market efficiency is used to evaluate the sales efficient of the resource input in the market promotion. The related financial factor of market efficiency is the profit-making ability.

$$\text{Profit rate} = (\text{profit}/\text{sales}) \times 100\% = (\text{profit}/\text{promotion cost}) \times (\text{promotion cost}/\text{sales}) \times 100\% \quad (1)$$

### 3.2.3 Financial efficiency

In financial efficiency, the relationships between the debt and financial cost as well as the debt rate in the capital structure are considered to evaluate if a company could gain enough capital for its operation and development with a low cost.

$$\text{Asset} = \text{debt} + \text{Owner's Equity} \quad (2)$$

Proprietary rights and interest indicates the net asset's ownership of investors including their investment and the interest added, which is the asset mentioned in plane A.

$$\text{Debt rate} = (\text{debt}/\text{asset}) \times 100\% = (\text{debt}/\text{financial cost}) \times 100\% \quad (3)$$

## 4 Precedent of Enterprise Performance Analysis

Table 1 shows the financial performance from 2008 to 2011 of Milan Station Holding Limited corporation, a company focus on retail sales of second-hand luxury branded handbags. After analysis and calculation table 2 is gained.

**Table 1 Financial Performance of Milan Station from 2008—2011 (Unit: 1000HKD)**

Year	2008	2009	2010	2011
Incomes	511,998	611,273	730,259	879,802
Total Profit	57,148	48,194	66,636	64,083
Total Asset	139,832	157,152	165,894	399,970

**Table 2 Capital Turnover Rate of Milan Station from 2008—2011**

Year	2008	2009	2010	2011
Asset Turnover Frequency	3.66	3.89	4.40	2.20
Profit Rate (%)	11.16	7.88	9.12	7.28

### 4.1 Asset management efficiency

Asset turnover frequency reflects the capital managing ability of a company, the faster the asset turnover, the stronger sales ability a company has. Table 2 shows that asset turnover frequency rises steadily, which means the management efficiency is in good state; in 2011, because of listing, the increase of income is much higher than asset, thus the asset turnover frequency decreased 50% than former year. This shows that rational allocation and integration of additional resources are still in progress after list.

### 4.2 Market efficiency

Table 2 figures out that in 2008 Milan Station have a relatively high profit rate. In other years, though the incomes increase, the profit rate is not steady. Especially in the listing year, the profit rate is the lowest among four years; furthermore, the year with the highest profit rate is also the year with the highest asset turnover frequency, which indicates that there may be a relationship between the profits and the asset turnover rate. With this information, administrators can have a clear picture of the company's performance and make decision accordingly.

### 4.3 Financial efficiency

According to the annual report of Milan Station (Table 3) from 2008 to 2011, the debt state can be arranged as shown in Table 4.

**Table 3 Capital Structure of Milan Station from 2008—2011 (Unit: 1000HKD)**

Year	2008	2009	2010	2011
Floating Asset	132,925	139,756	144,862	365,105
Fixed Asset	6,907	17,396	21,032	34,865
Short-Term Debt	22,873	42,898	31,854	28,004
Long-Term Debt	20,587	20,710	445	340

**Table 4 Capital Debt of Milan Station from 2008—2011 (Unit: 1000HKD)**

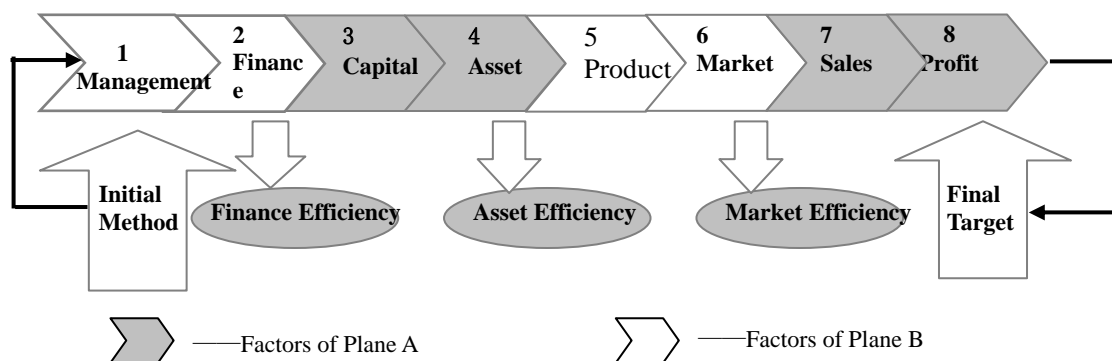
Year	2008	2009	2010	2011
Total Asset	139,832	157,152	165,894	399,970
Total Debt	43,460	63,608	32,299	28,344
Owner’s Equity	96,372	93,544	133,595	371,626
Liability/asset Ratio (%)	31.08	40.48	19.47	7.09

After calculation from Table 3, the liability to asset ratio of Milan Station in 2008 is 31.08%, while in 2009 is 40.48%, which keeps a relatively high rate under the safe level (usually the safe level is under 50%). In 2010, after the 20 million HKD repayment of long-term liabilities, this rate decreased to 19.74%. Furthermore, in 2011, the listing year, the rate goes to the lowest among four years, which shows that Milan Station keeps in a high financial security level. While compared to its low profit rate and asset turnover frequency shown in table 2, it suggested that the operator adjust the debt structure reasonably, so that the improvement of financial efficiency can be expected.

### 5 PVC Cause-Effect Chain Analysis

Combined plane A and plane B, a cause-effect chain including commercial factors and financial results is made to build a logistic thinking method of the operating process for entrepreneur

Take management factors in plane B as the start of the commercial process, and extend to capital and asset in plane A through financial functions, then return to the production (products or services) in plane B and finally turn to the profit which is the end of the commercial process through market functions (promotion).



**Figure 3 Flow Chart of PVC Commercial System**

PVC cause-effect chain analysis supplies a systematic management method for the enterprise to find out the factors that affect profit performance. And the analysis operating process as a whole, in other word, is to analyze the efficiency and property of asset distributions and give out the basis for the entrepreneur to form judgments and to improve operating manners.

### 6 Precedent of cause-effect chain analysis

#### 6.1 Management—enterprise structure model

Milan Station is principally engaged in the retail of unused and second-hand luxury branded handbags and apparel products in Hong Kong, the main land China and Macau. Since the opening of its first “Milan Station” retail shop in 2001 in Hong Kong, it possesses nearly ten years operation history. Milan Station operates retail shops under the brand names of “Milan Station” and “France Station”. Milan Station carries over 20 brands of handbag products and over 30 brands of other products from international luxury fashion houses. In 2011, the Group was successfully listed at the stock exchange of Hong Kong Limited on 23 May 2011.

#### 6.2 Annual financial report analysis

After analysis and calculation of the annual financial report of Milan Station, table 5 is gained.



**Table 5 The financial report analysis of Milan Station from 2008—2011**

Event	Year	2008	2009	2010	2011
Revenues(1000HKD)		511,998	611,273	730,259	879,802
Stock(1000HKD)		46,855	69,007	89,007	154,163
Profit rate (%)		-	19.39	19.47	20.48
Floating Asset rate (%)		95.06	88.93	87.32	91.28
Fixed Asset rate (%)		4.94	11.07	12.68	8.72
Short-Term Debt rate (%)		52.63	67.44	98.62	98.80
Long-Term Debt rate (%)		47.37	32.56	1.38	1.20
Floating Ratio		5.81	3.26	4.55	13.04
Speed Ratio		3.41	1.50	1.16	6.67
Operating cash flow(1000HKD)		31,512	13,118	-2,595	-4,350
Liability/asset(1000HKD)		96,372	93,544	133,595	371,626
Owner's Equity		96,372	93,544	133,595	371,626

Through calculation, it shows that the revenues from 2008 to 2011 grow steadily, but in the listing year, the profit decrease 3.83% than 2010 with the revenue increase 20.48%.

The short term debt rates of the company are 52.63% in 2008 and 67.44% in 2009, which is in a proper state. But in 2010 and 2011, after the 20 million HKD repayment, the short term debt rates soared to over 98%; the floating ratio reflects the repay ability of a short-term debt, while the ratios from 2008 to 2011 were 5.81, 3.26, 4.55 and 13.04 respectively. And the speed ratio represents the repay ability of a short-term debt without selling out its stock products, while the ratios were 3.41, 1.50, 1.16 and 6.67 respectively during 2008 to 2011. The performance of the two ratios show that the company has no currency pressure and debt repayment risk in a short term, thus it has lots of financial space to improve.

According to the annual report above, the operating cash flow in 2008 and 2009 is positive. Since the repayment of long-term liabilities in 2010 and big stock purchase in 2011, the operating cash flow goes to negative. If Milan Station keeps a stable development, the operating cash flow will return to a normal state.

### 6.3 Capital- shareholder's property

In Table 5, it can be observed that from 2008 to 2011 the shareholder's property of Milan Station is nearly increase every year. In 2011 the growth rate soared to 178.17% after its list on the stock market in the same year.

### 6.4 Asset structure

Floating assets accounted for 95.06%, 88.93%, 87.32% and 91.28% respectively from 2008 to 2011, which presented a stable and reasonable asset structure of the company.

### 6.5 Production-product development

The business of Milan Station focuses on the sale of second-hand and unused luxury branded products, in particular, handbags, from international fashion houses. This business model is designed to aim at providing a platform for its customers to purchase second-hand and unused luxury branded products at its retail shops and sell such products to the company thereafter for cash.

### 6.6 Market-competition and feature

According to the Synovate report, in respect of the total sales of the overall market for new, unused and second-hand luxury branded handbags by all retailers including boutiques or retail shops of international fashion houses and independent retailers in Hong Kong, the main land China and Macau for each of the two years ended 31 December 2008 and 2009, Milan Station accounted for 6.5% and 6.3% of the total sales in Hong Kong; 0.04% and 0.3% of the total sales in the main land China; and 4.7% and 5.5% of the total sales in Macau respectively; What's more Milan Station accounted for over 50% of market share of the total sales of luxury branded handbags among approximately 174 luxury branded handbags independent retailers in Hong Kong and ranked number one in terms of both sales value and sales volume among luxury branded handbag independent retailers in Hong Kong in 2009.

### 6.7 Sales-channel integration

Milan Station is principally engaged in the retail of unused and second-hand luxury branded

handbags and apparel products in Hong Kong, the main land China and Macau by operating a total of 14 retail shops under the brand names of “Milan Station” and “France Station”. Until 31st December 2011, the Group has been operating 16 retail shops under the brand name “Milan Station” with 11 retail shops in Hong Kong, 2 retail shops in Beijing, 2 retail shops in Shanghai and one retail shop in Macau.

#### **6.8 Profit-risks avoiding and high added value**

It is shown in the annual report that there are several risks in the development of Milan Station. Firstly, given the business model of Milan Station, it is exposed to various legal risks which may adversely affect its operation, financial condition and reputation. Secondly, the total revenue of Milan Station increasingly relies on the sale of unused products and premium priced products of over HK\$50,000, but both the sale of unused products and premium priced products have lower profit margin than other products. Finally, if Milan Station unwittingly purchased stolen, forgeries, counterfeit or any other illegal products, such products would be written-off from its inventories and the financial results of the Group would be adversely affected.

All the three factors may restrain the company from gaining ideal profits so that the improvement of the factors in the cause-effect chain is needed to have a better profit return.

### **7 Conclusion**

Luxury market is a short-term one with fast changing and tense competition on which an enterprise should make quick response in accordance with the change of environment. Enterprise performance analysis in PVC model makes a clear picture for entrepreneurs to start with the finance and to analyze a company in an all-round way so as to find the main problems and make suitable developing strategies to improve its flexibility to outwards changes.

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# Mathematical Analysis of Air Traffic Control Safety Risk Coupling\*

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**Abstract:** The structure of air traffic control safety risk is very complex, which includes not only human factors, equipment element, environment element, management factors leading to the single factor risk, but also coupling risk after their forming, such as the single factor coupling risk, double factors coupled risk and more risk factors coupling. This paper illuminates the ATC risk flow, the connotation and classification of ATC risk coupling. It also discusses the adding process of the risk flow and heterogeneous homogeneous risk through the mathematical method to reveal ATC safety risk coupling law. In this way the paper can provide theoretical guidance and reference method for security departments to control risk with high efficiency.

**Key words:** Air traffic control; Safety risk; Coupling risk flow; Mathematical analysis

## 1 Introduction

Air traffic control (ATC) is a large complicated system, involving the operating personnel, equipment, internal and external environment, the operation safety management, and other aspects. The principal task of ATC is safety risk control. American scholars Haynes in 1895 put forward the concept of risk for the first time, he defined risk as the opportunity or possibility of loss, showing that risk is a kind of possible situation of facing loss<sup>[1]</sup>. Risk usually use loss or profit expectations and standard deviation to measure. The greater variation indicates the greater risk; the smaller the variation is, the smaller the risk is. Therefore, the size of the risk depends on the probability of accident loss rate. In the basis of the definition of the risk, ATC safety risk refers to the possibility and the degree of loss of the unsafe incidents caused by the relevant factors from internal and external ATC system in particular conditions. Sven Ternov and Roland Akselsson introduced the analytical method of disrupting the effective obstacles to the air traffic control risk analysis; program model based on the accidents was constructed to identify the risk of the air traffic control quickly in complex systems using the DEB method<sup>[2]</sup>. Lee W K studied on aviation safety risk assessment; quantitative aviation risk assessment model was built using the fuzzy mathematical methods and the risk degree analysis principles. The prospective was proposed that the safety assessment approach can be used to manage and control aviation safety<sup>[3]</sup>. G.M.Sandquist, D.M. Slaughter and Y.kimura proposed the risk assessment model of the flight operations in high altitude areas through the analysis of the U.S. air traffic control situation combined with the free flight plan and risk assessment model theory<sup>[4]</sup>. Foreign scholars conducted depth study of the theoretical model of air traffic control safety risks; there are many qualitative analysis, but little for the quantitative analysis of air traffic control safety risks, especially the mathematical analysis of air traffic control safety risks.

Though the definition of risk is various, in essence, risk refers to the uncertainty of a variety of possible results which may occur in a certain period of time and condition, and the degree of the uncertainty can be estimated<sup>[5]</sup>. Due to a variety of uncertain factors, the expecting result is usually an interval or some points. Risk is the probability of failure by the consequences of failure and the two aspects of the variables of the decision, so the estimation for the occurrence probability and the loss is the process of qualitative judgment and quantitative analysis. Qualitative analysis is a relatively emotional, intuitive and easy analytical method; quantitative analysis is a scientific, objective and rational analysis. Qualitative and quantitative analysis can not be completely separated in the course of study, and the study on analysis and management of ATC safety risk should also comply with the general principle. This article analyzes the coupled air traffic control safety risks using the method of qualitative analysis, and conducts in-depth analysis and research on the coupling between the risk flows in the conduction process of the air traffic control safety risks applying the quantitative analysis method

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from a mathematical point of view.

## **2 Connotation and Classification of ATC Safety Risk Coupling**

### **2.1 Definition of ATC risk flow**

Risk flow refers to physics, electronics, and other disciplines research method, the risk as a kind of specific economic energy, the energy contained in risk source, because the outbreak of risk events and the impulse to release from risk source, attached to all kinds of risk carrier, to all the processes and functions node conduction and spread risk energy and function node together in the nature of the corresponding change happened, and finally form the different nature of the risk state<sup>[5]</sup>. ATC risk flow is to point to the ATC safety risk as a kind of special economic energy, can be in ATM safety system internal to follow certain rules flow and coupling, in ATC safety risk the risk of coupling flow contained in the risk source, because the interactions of risk events triggered. Risk source to burst out risk flow, because the risks event trigger ATC internal and external environment system state of being if the change as a result of. When ATC internal system and external environment condition is in equilibrium, risk source in its ideal quiet state, this time the risk is contained in flow in risk source, forming no real dynamic risk, not for aviation security threats; But along with risk events, when ATC system and the external environment within existing equilibrium state once change or is broken, risk source will deviate from its ideal state, burst risk flow, then began to flow in the ATM safety risk in the system and the coupling dynamic spread.

The essence of the research on ATC safety risk is to discuss each risk flow's changes in "quantity" and "quality" in the coupling process. Risk flow is the key factors in the process of the ATC safety risk coupling, and it is also the main research object in the study of ATC safety risk coupling. The data of characterization risk stream must be got to analyze ATC safety risk flow in the coupling process, the data mainly includes two kinds: (1) Data reflecting the state, including reflect internal system and the external environment the state data and reflect the risk of ATC safety state data, these data with the flow of risk is characterizing the value; Reflect ATC safety risk state data (including risk of produce, sudden flow, coupling conditions) use system and turn its state characterized. (2) Data reflecting the possibility of state, this kind of data are based on the risk of the parameters in the model the probability distribution of the data to value characterized.

### **2.2 Types of ATC risk coupling**

"Coupling" is derived from physics, refers to the phenomenon that two or more systems or two movements join together through interacting with each other. In the field of risk management, there exist the phenomenon that the occurrence and influence of certain risk depend on the extent of other risks, and the certain risk also influence the occurrence and extent of other risks. The interaction, mutual dependencies among the risks is called risk coupling. Therefore, ATC safety risk coupling is the relations of the mutual dependence and mutual influence formed among the various of risk factors in the process of the whole safety activities of the ATC safety system<sup>[6]</sup>. With China's civil aviation ATC and the international community, and air traffic increasingly busy, the composition of the ATC risk is more and more complex, including not only the single factor risk of human factors, equipment factors, environmental factors and management factors, including four of these risk factors between the risks of coupling form. Due to the existence of the ATC safety risk coupling, according to the size of the risk factors participating in the coupling, the risk of ATC safety coupling can be divided into three categories: single factor risk coupling, double risk factors and more risk factors coupling. The coupling of single-factor risk refers to the interactions and relationships between the respective individual risk factors in air traffic control safety system, the coupling factors include human ,equipment ,environment and management .Coupled risks caused by single-factor risk coupling only change the risk flow ,its nature does not change, so single factor coupling is also called "homogeneous risk coupling". Double risk factors coupling refers to the interactions and relations between the two risk factors in air traffic control safety systems, including people-machine, people-ring, people-tube, machine-ring, machine-pipe, ring-tube this several aspects of the coupling risk; More risk factors coupling refers to the interactions and relations among three or four risk factors in the ATC safety system, such as people-environment -machine risk coupling, people-machine-management risk coupling etc.The double risk factors and more risk factors coupling not only make the flow changed ,the nature of the risk flow are also changed, so it will double the risk factors and more risk factors coupled coupling is called "heterogeneous risk coupling".

### 3 Mathematical Analysis of ATC Risk

According to the risk classification, this paper discusses the superposition process of risk flow of homogeneous and heterogeneous risk coupling and carries on the mathematical description. Supposing ATC four single risk factors are A, B, C, D, including  $\alpha_1, \alpha_2, \alpha_3$  are risk correlation coefficient of A and B, A and C, A and D,  $\alpha_1', \alpha_2', \alpha_3'$  for risk corresponding conversion;  $\beta_1, \beta_2, \beta_3$  are risk correlation coefficient of B and A, B and C, B and D,  $\beta_1', \beta_2', \beta_3'$  are for risk corresponding conversion;  $\theta_1, \theta_2, \theta_3$  is respectively risk correlation coefficient of C and A, C and B, C and D,  $\theta_1', \theta_2', \theta_3'$  are risk of for corresponding conversion;  $\gamma_1, \gamma_2, \gamma_3$  are the risk of correlation coefficient of D and A, D and B, D and C,  $\gamma_1', \gamma_2', \gamma_3'$  are the risk of for corresponding conversion rates.

#### 3.1 The risk of the coupling mass flow

There are two identical factor (A) risk flow at time t recorded as  $Ra[1](t), Ra[2](t)$ , when  $Ra[1](t)$  and  $Ra[2](t)$  computed, the two strands of risk superposition merged into a stream of abandoned risk flow  $Ra[A]$ . Now An don't change risk nature,  $An = A$ ; Risk flow change size,  $Ea[A](t) = Ea[1](t) + Ea[2](t)$ . By analogy, along with the ATM safety that process continuously and thorough, have more of the same nature risk flow happen coupling stack, with  $Ra[i](i= 3, 4, \dots, N)$  to say, have the  $Ra[A]$  and  $Ra[i]$  mergers create  $Ra[Ai]$ . and every time the formation of coupling stack has  $Ai = An$  condition of this kind of homogeneous risk flow coupling process can be expressed as:

$$Ea[A_i](t) = Ea[1](t) + Ea[2](t) + \dots + Ea[i](t) = \sum_j^i Ea[i](t) \quad (A_i = A_n) \quad (1)$$

When i = N, are

$$Ea[A_N](t) = Ea[1](t) + Ea[2](t) + \dots + Ea[N](t) = \sum_j^i Ea[i](t) \quad (A_N = A_n) \quad (2)$$

That is when the N kind of the same type of risk flow coupling and merged into a stream of risk flow:

$$R_a(t) : \{E_a(t), A\} = R_a[N](t) : \{E_a[N](t), A_N\} \quad (3)$$

So, the t moment when ATC internal system state and external environment condition meet conditions, properties for An attribute of the  $Ra[i](t) : \{Ea[i](t), An\}$ , i happened  $\in N$  coupling, for the same kind of properties of the merger risk flow  $Ra(t) : \{Ea(t), A\}$ , the risk of the coupling stack process:

$$E_a(t) = \sum_{i=1}^N Ea[i](t) \quad (A_i = A_n) \quad (4)$$

#### 3.2 The risk of heterogeneous flow coupling

When different risk flows are coupled, the virtue of the risk flow will produce some degree of transformation. How many of the transformation between risk and the correlation coefficient, related to the size of the conversion rate. Risk associated coefficient refers to the risk of relevance between size, by risk the dependent each function of the correlation between nodes business decision; Conversion rate risk is a risk into another kind of risk proportion, the flow of nature by risk their properties and suitability decided to risk, the risk that the significance of the conversion efficiency can be, its value is less than or equal to 1.

The ATC heterogeneous risk flow coupling can be divided into two factors risk flow coupling, three factors risk flow coupling and four factors risk flow coupling according to the number of risk factors involved in the coupling .the first two kind of coupling are a special case of the four factors risk flow coupling . Therefore, if the calculation formula of the four factors risk flow coupling can be deduced , the other two special case can be solved easily. The hypothesis in t moment, when ATC internal system state and external environment condition of state meet, ATM safety system in four different nature risk notes for A, B, C, D. The risk flow of them were recorded as  $Ra[h](t), Rb[i](t), Rc[j](t), Rd[k](t)$ , when they coupling is  $Ra[h](t)$  risk of traffic will into  $Rb[i](t), Rc[j](t), Rd[k](t)$  of the flow and  $Rb[i](t)$  part of the energy into  $Ra[h](t), Rc[j](t), Rd[k](t)$  of energy,  $Rc[j](t)$  part of the energy into  $Ra[h](t), Rb[i](t), Rd[k](t)$  of energy.  $Rd[k](t)$  part of the energy into  $Ra[h](t), Rb[i](t), Rc[j](t)$  of energy, namely:

$$\begin{cases} E_a'[h](t) = E_a[h](t) + \Delta E_a(h) & (A_h' = A_h) \\ E_b'[i](t) = E_b[i](t) + \Delta E_b(i) & (B_i' = B_i) \\ E_c'[j](t) = E_c[j](t) + \Delta E_c(j) & (C_j' = C_j) \\ E_d'[k](t) = E_d[k](t) + \Delta E_d(k) & (D_k' = D_k) \end{cases} \quad (5)$$

Hypothesis  $Ra[h](t)$  part of the energy into  $Rb[i](t)$  source of energy for  $E_1$ , target energy  $\alpha_1 E_1$ , into  $Rc[j](t)$  source of energy for  $E_2$ , target energy  $\alpha_2 E_2$ , into  $Rd[k](t)$  source of energy for  $E_3$ , target energy  $\alpha_3 E_3$ ;  $Rb[i](t)$  part of the energy into  $Ra[h](t)$  source of energy for  $E_4$ , target energy  $\beta_1 E_4$ , into  $Rc[j](t)$  source of energy for  $E_5$ , target energy  $\beta_2 E_5$ , into  $Rd[k](t)$  source of energy for  $E_6$ , target energy  $\beta_3 E_6$ ;  $Rc[j](t)$  part of the energy into  $Ra[h](t)$  source of energy for  $E_7$ , target energy  $\theta_1 E_7$ , into  $Rb[i](t)$  source of energy for  $E_8$ , target energy  $\theta_2 E_8$ , into  $Rd[k](t)$  source of energy for  $E_9$ , target energy  $\theta_3 E_9$ ;  $Rd[k](t)$  into  $Ra[h](t)$  source of energy for  $E_{10}$ , target energy  $\gamma_1 E_{10}$ , into  $Rb[i](t)$  source of energy for  $E_{11}$ , target energy  $\gamma_2 E_{11}$ , into  $Rc[j](t)$  source of energy for  $E_{12}$ , target energy  $\gamma_3 E_{12}$ . Four kinds of risk factors between the flow transformation process as shown in figure 1 below.

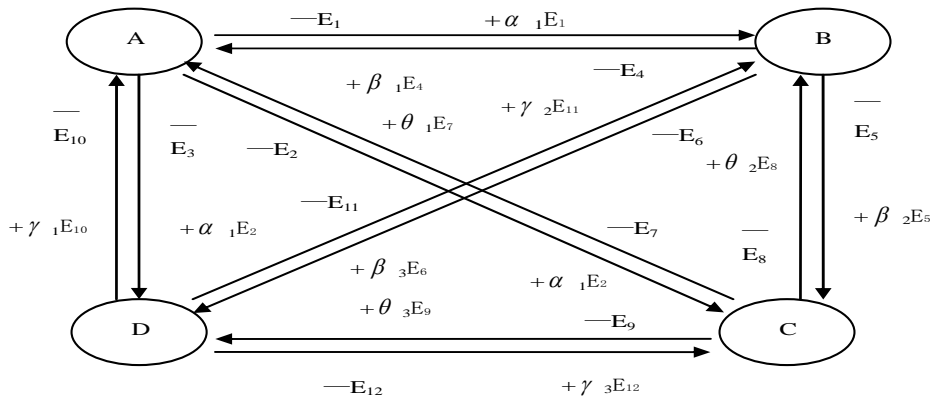


Figure 1 Four Factors Between Risk Flow Transformation

So the quantity changes between them are:

$$\begin{cases} E_a'[h](t) = E_a[h](t) - E_1 - E_2 - E_3 + \beta_1 E_4 + \theta_1 E_7 + \gamma_1 E_{10} & (A_h' = A_h) \\ E_b'[i](t) = E_b[i](t) - E_4 - E_5 - E_6 + \alpha_1 E_1 + \theta_2 E_8 + \gamma_2 E_{11} & (B_i' = B_i) \\ E_c'[j](t) = E_c[j](t) - E_7 - E_8 - E_9 + \alpha_2 E_2 + \beta_2 E_5 + \gamma_3 E_{12} & (C_j' = C_j) \\ E_d'[k](t) = E_d[k](t) - E_{10} - E_{11} - E_{12} + \alpha_3 E_3 + \beta_3 E_6 + \theta_3 E_9 & (D_k' = D_k) \end{cases} \quad (6)$$

When  $Ea[h](t)$  indicates a 0,  $Eb[i](t)$  indicates a 0,  $Ec[j](t)$  indicates a 0, and  $Ed[k](t)$  indicates a 0, make :

$$\begin{aligned} \alpha_1' &= \frac{E_1}{E_a[h](t)} & \alpha_2' &= \frac{E_2}{E_a[h](t)} & \alpha_3' &= \frac{E_3}{E_a[h](t)} \\ \beta_1' &= \frac{E_4}{E_b[i](t)} & \beta_2' &= \frac{E_5}{E_b[i](t)} & \beta_3' &= \frac{E_6}{E_b[i](t)} \\ \theta_1' &= \frac{E_7}{E_c[j](t)} & \theta_2' &= \frac{E_8}{E_c[j](t)} & \theta_3' &= \frac{E_9}{E_c[j](t)} \\ \gamma_1' &= \frac{E_{10}}{E_d[k](t)} & \gamma_2' &= \frac{E_{11}}{E_d[k](t)} & \gamma_3' &= \frac{E_{12}}{E_d[k](t)} \end{aligned}$$

The calculation fomula are as follows:

$$\begin{cases} E_a[h](t) = (1 - \alpha_1' - \alpha_2' - \alpha_3') E_a[h](t) + \beta_1 \beta_1' E_b[i](t) + \theta_1 \theta_1' E_c[j](t) + \gamma_1 \gamma_1' E_d[k](t) & (A_h' = A_h) \\ E_b[i](t) = (1 - \beta_1' - \beta_2' - \beta_3') E_b[i](t) + \alpha_1 \alpha_1' E_a[h](t) + \theta_2 \theta_2' E_c[j](t) + \gamma_2 \gamma_2' E_d[k](t) & (B_i' = B_i) \\ E_c[j](t) = (1 - \theta_1' - \theta_2' - \theta_3') E_c[j](t) + \alpha_2 \alpha_2' E_a[h](t) + \beta_2 \beta_2' E_b[i](t) + \gamma_3 \gamma_3' E_d[k](t) & (C_j' = C_j) \\ E_d[k](t) = (1 - \gamma_1' - \gamma_2' - \gamma_3') E_d[k](t) + \alpha_3 \alpha_3' E_a[h](t) + \beta_3 \beta_3' E_b[i](t) + \theta_3 \theta_3' E_c[j](t) & (D_k' = D_k) \end{cases} \quad (7)$$

Double risk factors flow coupling, three factors flow coupling calculation formula of risk only participate in the coupling of the selection risk flow, the generation into the formula (7) can draw their own risk flow coupling formula.

#### 4 Conclusions

Through the behavior analysis of the air traffic control safety risk couplings and the mathematical analysis of risk flows, main conclusions are drawn as follows:

(1) The risk of coupling flow size depends on three main factors, namely primitive risk flow, the correlation coefficient between risk and risk conversion.

(2) In the risk coupling analysis, each time the risk couplings happen, the changes of the corresponding risk flow is not sure and unpredictable. But the risk coupling in the same condition accord with certain law, through the probability and mathematical statistics the rule can be approximately deduced. Risk correlation coefficient and approximation of the risk of conversion rates can be got through statistics and calculation of the data, and then the risk of flow values of different risk factors coupling can be calculated.

(3) The risk of coupling flow state has a close relationship with ATC security defense system. When risk flow value is less than the maximum security system threshold, the risk of flow is in a stable state and easy to control; When the value of risk flow of security system is greater than the biggest threshold, the risk of flow is active state and easy to cause new risks.

Therefore, the air traffic control department should on the one hand enhance the construction of the ATC safety risk management information system which can increase the risk threshold of the security system directly; on the other hand, the awareness of risk prevention should be raised to block the path of the risk coupling, reducing the value of risk flow indirectly to enhance the system's ability of resisting risks.

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# Research on Credit Risk Management in Industrial and Commercial Companies Based on RAROC

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**Abstract:** The credit risk management in industrial and commercial companies in our country is weak, and credit risk management has become one of the most important problems which must be dealt with. The paper gives a proposal that applying the RAROC (Risk Adjusted Return on Capital) to the industrial and commercial companies in our country, which is based on some risk manage theories and methods in financial area and take the characteristics and present situation of the companies into account. The paper proves that RAROC performs well in providing basic information for credit decision and makes a balance between risks and benefits, and will improve the level of credit risk management and promote the development of the enterprise.

**Key words:** Credit risk management; Commercial and industrial companies; Risk adjusted return on capital; Feasibility Analysis

## 1 Introduction

Credit is the basic characteristic in the modern market economy. Not only the financial sector cannot exist without credit, but also credit in the market economy of every area plays a great role<sup>[1]</sup>. Although industrial and commercial companies gradually build credit risk management mechanism in recent years, most Chinese industrial and commercial companies still adopt the traditional, qualitative customer credit evaluation method. None scientific evaluation and measure credit risk model framework and the corresponding performance evaluation system have been set up. According to the National Institute of the Ministry of Commerce Statistics, because Chinese industrial and commercial companies fail to establish a scientific credit management system, companies' credit sales of bad debts become serious and the default payment last for a long time. Bad debts take up on average 5%-10%, comparing the American 0.25%-0.5%, which is 10 times as much difference. This exposes several phenomena of weak credit risk management in industrial and commercial companies. Credit risk management has become one of problems that should be solved urgently. This paper refers to the financial area of some credit risk management concepts and methods, combined with industry and commerce of the characteristics and present situation of industrial and commercial companies. It puts forward RAROC model that can be applied to credit risk management in industrial and commercial companies for credit granting decision, provides data support, correct guidance of company credit business development and the balance of risks and benefits. Finally it enhances the level of credit risk management and promotes the development of companies.

## 2 Model Description

### 2.1 RAROC model

RAROC is short for Risk Adjusted Return on Capital. Its core idea is to quantify the risk of loss which can be expected in the future as the current cost, and to adjust current earnings, for measuring the size of the risk-adjusted revenue<sup>[2]</sup>. After the 1990s, the application of RAROC model continues to improve and becomes the primary means of management in international commercial banks. The specific calculation and analysis process can be shown in formula 2.1:

$$\text{RAROC} = (\text{Revenue} - \text{Operating Cost} - \text{Expected Loss}) / \text{Economic capital} \quad (1)$$

For the financial institutions, the revenue can be spread income and non-interest income (such as service charges, etc.). Operating cost is the cost of bank management. Expected loss of the different types of risk has different measurement methods, but its elements are four aspects, that is Probability of Default, Loss Given of Default, Exposure at Default and Maturity. Economic capital is the minimum need of risk banks take.

### 2.2 Metrics

For the present model, the main metrics include total revenue, operating cost, expected loss and economic capital. For industrial and commercial companies, total income and operating cost are relatively clear of its overall sales revenue and operating procedures of the expenditures. What's more,



the calculation of operating costs can be done through the pooling and sharing of cost afterwards to predict future costs. In addition, by track recording single business operating costs for different types, various types of average operating cost could be calculated through the historical average costs.

Expected losses (EL) usually refers to an average loss during the loan, which is the focus should be measured in the RAROC. It can be determined by statistical methods and it's the amount of loss can be expected in the course of business, being an indicator to reflect the credit risk. It can be expressed as shown in formula 2.2:

$$\text{Expected Loss} = \text{Exposure at Default} \times \text{Probability of Default} \times \text{Loss Given of Default} \quad (2)$$

Economic capital (EC) is the minimum amount of capital bank needs calculated by the bank's internal management personnel according to the risk assumed. Because it is directly linked with the bank to take risks, it also becomes a Capital at Risk<sup>[3]</sup>. In actual measurement, the unexpected loss caused by credit risk can be used to approximate the economic capital. Unexpected loss(UL) corresponds to expected loss. Understanding from the statistical significance, expected loss is the loss distribution of the mean, while unexpected loss is the standard deviation of the loss distribution. Unexpected loss can be released by economic capital to, in order to prevent bank failures.

This paper draws on the measure based on experience or historical data developed by the Bank of America. This method only considers the unintended risk of default factors. Under the conditions of only two states, which is breach of contract and not breach of contract, unexpected losses can be calculated as formula 2.3<sup>[4]</sup>:

$$UL = EAD \times \sqrt{EDF \times \sigma_{LGD}^2 + LGD^2 \times \sigma_{EDF}^2} \quad (3)$$

If the  $LGD$  is determined, that is  $\sigma_{LGD} = 0$ , the above equation can be simplified to formula 2.4:

$$UL = EAD \times LGD \times \sigma_{EDF} \quad (4)$$

$\sigma_{EDF}$  can be calculated by a simple method, using the binomial model. Based on the data of  $N$  years, suppose  $EDF_i$  is the default rate of year  $i^{\text{th}}$ , then  $\sigma_{EDF}$  can be gotten:

$$\sigma_{EDF} = \sqrt{\frac{\sum_{i=1}^N EDF_i(1-EDF_i)}{N}} \quad (5)$$

If default is a two state event, default rate, namely variance of  $EDF$  can be calculated:

$$\sigma_{EDF}^2 = EDF \times (1-EDF) \quad (6)$$

After getting unexpected loss, some kind of risk control is needed when banks decide to use how much economic capital to make up for unexpected loss. Thus, there is a necessity to multiple the result of unexpected loss by  $\alpha$ . Economic capital can be gotten as following:

$$EC = \alpha \times UL = \alpha \times EAD \times LGD \times \sigma_{EDF} \quad (7)$$

Is not only related to the attitude banks own faced with risk, but also combined with loss distribution. According to the report<sup>[5]</sup>, capital multiplier used by the banks of America is six, and during the next applications, most take this data. If banks have higher risk control requirements, the multiplier increases accordingly.

### 3 Design

#### 3.1 Feasibility analysis

Credit is not a dedicated transaction in financial institutions. Due to its transaction efficiency as well as its benefits to businesses and society as, credit is widely used in all aspects of the market, while the credit risk faced by commercial companies and financial institutions, which have highly similarity. Its credit risk comes from the debtor's default. However it is essentially a possibility of loss, and credit risk can be measured via a similar method. Its credit risk is made up with several major factors: expected default, expected loss rate of given default, risk exposure and duration. Increasing credit cases to trade on credit risk management has led to higher significance to the survival and development of companied. Thus, the requirements for credit risk management must be increasingly high.

The core idea of RAROC model is to measure the size of the return per unit of capital, efficiently combine the benefit and risk companies faced with so as to let decision-makers make better decisions weighing against the risks and benefits. RAROC can be applied to loan pricing, capital allocation, comprehensive risk management and performance appraisal in financial institutions, etc.. In addition, it can be applied to credit risk management of industrial and commercial companies. So using RAROC

model in credit risk management of industrial and commercial companies can enhance the strong feasibility of the existing credit risk management system, and help play larger role in promoting long-term survival and development of companies.

Given the above analysis, based on the status of business credit risk management, "three-stage program" of RAROC model used in industrial and commercial companies has been put forward: the first stage is standardizing business credit management data in accordance with the requirements of the RAROC model; the second stage is accumulating a certain amount of historical data in accordance with the standardized data in order to provide sufficient data to support decision-making; the third stage is the RAROC model officially used in enterprise risk management to help enterprise decision-making.

### 3.2 Data comparative analysis

#### 3.2.1 Numerical example

Because RAROC model's effective application cannot leave reliable and targeted credit rating system, this paper's example simulation analysis is based on a certain industry and commerce enterprise which has set up effective credit rating system assumption, and then chooses a business objects to conduct the analysis of the application. Referring to the international famous institution Moody's "Different Credit Rating Customers Expect Default Weight Level Table", the value can be calculated.

Supposed an industrial and commercial company proceeds credit transactions and sells its credit products to a client which named X, predicted the sales value is expected to 100 million which is not including tax, and the gross profit margin is 3%. According to the client X draft, the enterprise confirms the line of credit is 20 million, credit granting deadline is 60 days and the validity period is 360 days.

Client X is a registered customer to this industry and commerce enterprise, credit risk management departments has its credit record. Because of several overdue payment behavior, and through the analysis of this distributor financial situation, it's found that its operating condition is deteriorating and recently its credit rating is BB. Consulting "transaction object credit rating table", its EDF is 7.00%, LGD is 39%.

Supposed this industrial and commercial company sets its benchmark management cost rate to 0.2%, funding opportunity cost to 5.4%(China's inflation rate in 2011), EAD accounting for 70% of credit line and benchmark rate of return to 27%. The loss rate of credit rating expected default can be shown in the table 1.

**Table 1 Different Credit Rating Customers Expect Default Weight Level**

Credit rating	Anticipatory breach of contract	Anticipatory loss breach of contract
AAA	2.00%	0%
AA	2.70%	16%
A	3.10%	24%
BBB	4.70%	33%
BB	7.00%	39%
B	8.10%	38%
CCC	23.45%	55%

$$\text{Revenue} = \text{Sales Amount} \times \text{Gross Profit Rate} = 10000 \times 3\% = 3 \text{ million}$$

$$\text{Operational Cost} = \text{Sales Amount} \times \text{Benchmark Management Cost Rate} = 10000 \times 0.2\% = 0.2 \text{ Million}$$

$$\text{Opportunity Cost of Capital} = \text{EAD} \times \text{Opportunity Rate of Capital} = 0.756 \text{ million}$$

$$\text{EAD} = \text{Credit Line} \times 70\% = 2000 \times 70\% = 14 \text{ million}$$

$$\text{EDF} = 7.0\% \times \text{LGD} = 39\%$$

$$\text{EL} = \text{EAD} \times \text{EDF} \times \text{LGD} = 1400 \times 7.0\% \times 39\% = 0.3822 \text{ million}$$

$$\text{Economic capital multiplier } \alpha = 6$$

$$\sigma_{\text{EDF}} = \sqrt{\text{EDF} \times (1 - \text{EDF})} = \sqrt{270\% \times (1 - 270\%)} = 0.0651$$

$$\text{EC} = \alpha \times \text{UL} = \alpha \times \text{EAD} \times \text{LGD} \times \sigma_{\text{EDF}} = 2.132676 \text{ million}$$

$$\text{RAROC} = (\text{Revenue} - \text{operational cost} - \text{EL}) / \text{economic capital} = 77.92\%$$

According to above calculation, we can found this credit granting value is 77.92%, greater than benchmark rate of return, illustrate that this credit granting can produce profit, and so approves this credit granting.

#### 3.2.2 Data analysis

Applying for 2010 credit business data of a large steel enterprise and put RAROC model into use simulation decision-making, by contrast the general profit difference between before and after benefit to

enterprise through RAROC model, it can be determined whether the RAROC model is beneficial to enterprise risk management decision-making. Due to the steel enterprise not yet set up its own credit rating system, its risk management largely cooperates with Dunn & Bradstreet, and the enterprise's report provides risk early warning scale, which is put forward to analysis and assess transaction objects as follow:

**Table 2 Risk Early Warning Scale**

Risk early warning rating	Risk zone	Possibility of appearing high risk enterprise	Risk early warning score meaning	enterprise ratio in database
1	Low risk section	2%	Lowest risk	10.50%
2		2.70%	Low risk	8.60%
3		3.10%	Lower risk	10.80%
4	Medium risk section	4.70%	Low average risk	16.30%
5		7.00%	Slightly lower than average risk	15.90%
6		8.10%	Average risk	11.40%
7	High risk section	10.90%	High average risk	7.10%
8		16.50%	High risk	6.80%
9		24.50%	Higher risk	6.50%
10		41.90%	Highest risk	6.10%

Dunn & Bradstreet's risk early warning scale report reveals the level of transaction objects' credit rating and transaction risk, risk early warning scale can be used to structure transaction objects' credit rating table 3:

**Table 3 Transaction Objects' Credit Rating**

Dunn & Bradstreet risk early warning rating	Corresponding credit rank	Credit condition overall evaluation
1	AAA	Nice
2	AA	
3	A	
4	BBB	Common
5	BB	
6	B	
7-10	CCC and lower	Worse

Choosing 20 trade samples in the credit extension business happened in 2010, samples as table 3-4 follows:

**Table 4 20 Trade Sample Analysis**

Sample	1	2	3	4	5	6	7	8	9	10
Credit line	3000	8000	10000	4000	6000	9500	4000	7000	6500	5000
Transaction sum	20000	12000	21500	10500	12500	15000	12500	12300	11400	9500
Gross profit ratio	4%	3%	3%	5%	3%	3%	4%	3%	4%	3%
Credit rating	AAA	AAA	AAA	AAA	AA	AA	AA	AA	A	A
Default or not	no	no	no	no	no	no	no	no	no	no
Profit	800	360	645	525	375	450	500	369	456	285
Default loss										
Sample	11	12	13	14	15	16	17	18	19	20
Credit line	5000	4500	4000	4000	3500	3000	1000	3000	1000	2000
Transaction sum	8600	12000	9800	8700	9400	5600	3900	7800	3900	5400
Gross profit ratio	3%	4%	3%	3%	3%	3%	4%	3%	3%	3%

Credit rating	A	A	BBB	BBB	BBB	BBB	BB	BB	BB	BB
Default or not	yes	no	no	yes	no	yes	no	no	yes	yes
Profit		480	294		282		156	234		
Default loss	260			434.3		325.7			97.4	347.3

Putting the 20 samples into RAROC model, conducting simulation decision-making, and then contrasting to the former decision, it can be found cost rate of capital is 5.4% and benchmark operation cost rate is 0.2%. Its result as table 5:

**Table 5 20 Sample Transaction Reckoning**

Sample	1	2	3	4	5	6	7	8	9	10
RAROC value					0.9918	0.1918	4.4140	0.474	0.780	0.3366
Base earnings ratio	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%
Reaching the standard or not	yes	yes	yes	yes	yes	no	yes	yes	yes	yes
Default or not	no	no	no	no	no	no	no	no	no	no
Profit	800	360	645	525	375	450	500	369	456	285
Default loss										
Sample	11	12	13	14	15	16	17	18	19	20
RAROC value	0.1701	1.9262	0.3212	0.1972	0.4276	0.0581	0.8561	0.1490	0.490	0.1753
Base earnings ratio	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%
Reaching the standard or not	no	yes	yes	no	yes	no	yes	no	yes	no
Default or not	yes	no	no	yes	no	yes	no	no	yes	yes
Profit		480	294		282		156	234		
Default loss	260			434.3		325.7			97.4	347.3

In fact, the above samples are the credit business through the enterprise audit credit extension, but its decision-making degree of accuracy is not so high. Among 20 samples, there are 5 samples owning default phenomena and its default loss is so big. By contrast in the 5 default samples, applying for RAROC model has correctly forecasted 4 default phenomena, so it can be suggested to refuse this object's credit applies. According to the reckoning result of RAROC model, refusing 6 credit applies among 20 sample and 2 samples doesn't have default phenomena, but in the refuse samples of RAROC model, 1 sample produces default phenomenon. According to the former decision, 20 samples' profit sum is 53.373 million. If adopting the credit decision advice, its profit sum is 60.206 million. Thus, although RAROC model cannot forecast future default phenomenon accurately, it can better control transaction risk and enlarge enterprise's overall profit.

#### 4 Conclusion

Based on the understanding existing credit risk management concepts and methods, combined with widely used advanced method in the financial field, this paper puts forward the plan that RAROC model can be applied to Chinese industrial and commercial company credit risk management. According to the actual situation, focused on feasibility, this paper creatively proposes three-step strategy RAROC model of applied by Chinese industrial and commercial companies: data standardization, data accumulation,

and model application.

This paper tracks a large Chinese steel company which has completed the credit business, uses the RAROC model to make a second decision of the credit business, and compares the different effect of decision by using RAROC before and after. Finally the result shows that using RAROC model can better control the credit risk, improve company's whole benefit, which means that the usage of RAROC model in Chinese industrial and commercial companies can help them to solve weighing problem between risk and profit. What's more, RAROC model can quantify risk as currency index, solve the arbitrary and subjectivity in decision-making of company risk, and improve the management efficiency, which can enhance the competitiveness of companies.

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## Innovation Through Performance-Based Contracts: A Transaction Cost Economics and Agency Theory Perspective

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**Abstract:** Although incomplete contracts are generally viewed as inefficient governance mechanisms, some authors suggest that a specific type of incomplete contract, namely, the performance-based contract, fosters innovation. A performance-based contract is characterized by low term specificity (i.e. contractual incompleteness) and rewards being tied to performance. Based on an integration of transaction cost economics and agency theory we hypothesize how PBCs affect innovation. We argue that low term specificity, i.e., not stipulating how the partner should deliver the performance and which resources to use, enhances a partner's autonomy, which in turn fosters innovation. However, too low term specificity inhibits innovation. Furthermore, we state that tying rewards to performance positively affects innovation. This relationship is, however, negatively moderated by the partner's degree of risk-averseness.

**Key words:** Innovation; Inter-organisational relationship; Contracts; Performance based contract

### 1 Introduction

Innovation (both radical and incremental) in products, process and services, is critical for firms to gain and sustain competitive advantage (Brown & Eisenhardt, 1995; Roberts, 1999; Tether & Tajar, 2008). Inter-organisational relationships (IORs) (Phelps, 2010) are an increasingly important way to engage in innovation. More specifically, IORs are thought to enhance (Faems, Looy, & Debackere, 2005; Goes & Park, 1997; Teece, Pisano, & Shuen, 1997) or even drive (Hamel, 1991; Leonard-Barton, 1995) innovation. IORs are quasi-integrated structures between markets and hierarchies (Im & Rai, 2008) used for product and service development, market access, and leveraging process capabilities of partners (Lavie & Rosenkopf, 2006). At the same time, inter-firm collaboration may lead to exploitation by an opportunistic partner (Malhotra & Lumineau, 2011; Walker & Weber, 1984; Williamson, 1985) and may suffer from coordination failures that impede the efforts of even well-intentioned parties (Gulati, Lawrence, & Puranam, 2005; Malhotra & Lumineau, 2011). These hazards pose a threat to organisational performance, as they can inhibit innovation if not governed properly (Mellewigt, Madhok, & Weiber, 2007; Ryall & Sampson, 2003).

In response, organizations use governance mechanisms such as contracts to mitigate these hazards (Lumineau & Malhotra, 2011; Ring & Van de Ven, 1992). Transaction cost economics theory prescribes that organizations should design contracts that are highly complete in order to minimize the hazards and maximize transaction gains (Williamson, 1979; Saussier, 2000). However, as organizations are unable to foresee all future events and consider both ex ante and ex post transaction costs, organizations frequently write contracts that are incomplete (Mayer & Argyres, 2004).

Unfortunately, incomplete contracts are deemed poorly designed governance mechanisms, since they do not sufficiently address the transaction characteristics that may result in opportunistic behavior (Goldberg, 1976; 1985; Williamson, 1985). Nevertheless, incomplete contracts do offer some benefits: for example, incomplete contracts are more flexible (Bernheim & Whinston, 1998; Crocker & Masten, 1991) in comparison with detailed contracts, the rigidity of which is argued to inhibit innovation (Hart, 1989; Wang, Yeung, & Zhang, 2011). More specifically, performance-based contracts (PBCs), an incomplete contracting type used in the context of partnering with an organization that delivers services, are suggested to positively affect innovation (Gates, Klein, Akabas, Myers, Schwager, & Kaelin-Kee, 2004; Kim, Morris & Netessine, 2007; Martin, 2002; Ng & Nudurupati, 2010; Ng, Maull, & Yip, 2009).

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PBCs are characterized by low term specificity and rewards being tied to performance. Low term specificity refers to the fact that PBCs underline the outcome of the transaction rather than prescribing *how* to deliver it or which resources to use; as such, they promote new and improved ways of delivering a certain performance (Kim et al., 2007).

Thus, on the one hand, incomplete contracts are viewed as inefficient governance mechanisms. On the other hand, incomplete contracts, or more specifically PBCs, are suggested to foster innovation. This raises questions with regard to how these two issues are related: (when) do the positive effects on innovation outweigh the inefficiency in terms of governance? In the current paper, we contribute to this debate by focusing on PBCs as a specific type of incomplete contract and developing a conceptual model which explains how PBCs affect innovation. By linking these concepts we hope to take a first step towards enhancing our understanding as to how incomplete contracts could affect relationship outcome (i.e. innovation), as extant literature mainly focuses on the negative effects of incomplete contracts on relationship outcome (Williamson, 1985). Only few studies link contracts to positive relationship outcomes (Anderson & Dekker, 2005).

Our theoretical model is based upon an integration of agency- and transaction cost theory of contractual governance. The values and limitations of these established theoretical perspectives are well understood (Johnson & Medcof, 2007) and have extensively been used in research into the design of contracts and their effects on performance (Argyres, Bercovitz & Mayer, 2007; Argyres & Mayer, 2007; Eisenhardt, 1989; Luo, 2002; Reuer & Arino, 2007; Saussier, 2000; Williamson, 1985)<sup>1</sup>. Nevertheless, none of these papers has yet attempted to combine these two theories to understand the effects of (incomplete) contracts in general, and PBCs in particular, on innovation. Such a combination has merits, as both theories have traditionally been used to address issues of formal control. Freedom to innovate can be viewed as the opposite of formal control (Johnson & Medcof, 2007); therefore, these control-based theories offer a framework within which to address situations of alleviated control (Johnson & Medcof, 2007).

The remainder of this paper is organized as follows: first, we review literature on incomplete contracting and performance-based contracting to enhance our understanding of incomplete contracts in relation to innovation as a specific type of relationship outcome. We then develop hypotheses on how characteristics of PBCs affect innovation. We ground our hypotheses in literature and also use a number of actual contracts and interviews to strengthen and illustrate our arguments. These contracts and interviews concern two IORs involving a large financial services firm (Alpha) and two of its IT partners, Sigma and Kappa, whose names we were asked to disguise. Sigma, a small IT services firm, is responsible for the IT infrastructure of Alpha's asset management division. Kappa, a large telecommunication and IT services firm, is responsible for Alpha's telecommunication and IT infrastructure. The paper concludes with implications and avenues for future research.

## 2 Governing Inter-Organisational Relationships

In order to ensure successful inter-firm collaboration, organizations make use of formal controls, such as contracts, to govern IORs (Das & Teng, 2001). Whereas formal agreements may take various forms (written or verbal, implicit or explicit), contracts refer to written agreements which are legally binding (Lyons & Mehta, 1997; Woolthuis et al., 2005). Contracts provide safeguards against ex post performance problems by inhibiting the partner to pursue its individual objectives at the expense of mutual benefits (Luo, 2002). To maximize relationship gains, contracts should be as complete as possible (Williamson, 1979; 1985) and contain clauses that address all sources of opportunistic behavior. Complete contracts are contingent on all events that are relevant to the fulfillment of the contract and they represent what organizations could write in a world in which all future events can be foreseen (Saussier, 2000). As a result, the parties' obligations are specified in every possible eventuality (Crocker & Masten, 1991; Saussier, 2000). Complete contracts attain two objectives: 1) they inhibit opportunistic behavior; and 2) they stipulate responses to all possible future events. Hence, parties can deal with such events without renegotiation (Al-Najjar, 1995).

Despite the complexity inherent in drawing up complete contracts, the risk of ex-post hazards is such that organizations are likely to create contracts that are close to complete (Carson, Madhok, & Wu,

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<sup>1</sup> This paper will not discuss the basic traits of these theories. There are several well established introductions into these theories, such as Williamson (1985) for transaction cost theory and the foundations of agency theory by Arrow (1985) and Eisenhardt (1989).

2006; Lyons, 1996). At the same time, as complete contracts explicitly prescribe roles and obligations, determine the content of the transaction, and specify rules for violating contractual agreements (Argyres & Mayer, 2007; Poppo & Zenger, 2002), they may result in a rigid relationship which hinders innovation (Arad, Hanson, & Schneider, 1997; Wang, Yeung, & Zhang, 2011). Furthermore, detailed contracts can be considered as a sign of distrust (Goshal & Moran, 1996), resulting in a barrier to knowledge transfer, which also inhibits innovation. Overly specified contracts may also hamper information exchange between the parties due to clear contractual specification of what is and is not allowed (Wang et al., 2011). Hence, detailed contracts may reduce uncertainty, but also flexibility (Argyres & Mayer, 2007), as they restrict the partner in adjusting to changes and to innovate (Wang et al., 2011). This suggests that, while protecting the organization against ex post problems by drafting more detailed agreements, many contracts fail to enable innovation.

In reality however, one frequently observes contracts that are incomplete (Al-Najjar, 1995; Hart & Moore, 1988; Kloyer & Scholderer, 2012; Mayer & Argyres, 2004). Incomplete contracts do not specify observable obligations and actions for the parties (Bernheim & Whinston, 1998). This degree to which observable obligations and actions are specified in the contract is coined 'term specificity' (Luo, 2002). Two common views explain the observation that contracts are inevitably incomplete. First, incomplete contracts relax the extreme rationality assumption which holds for complete contracts. Parties are subject to bounded rationality; that is, they are not able to foresee all future contingencies (Aghion & Holden, 2011; Tirole, 1999). Hence, parties may not identify some contingencies, or not acknowledge the need to specify certain dimensions of contractual performance (Bernheim & Whinston, 1998). Even if it were possible to foresee future contingencies, some actions are only observable by one party, or cannot be written in a way which can be legally enforced by a third party (i.e. court) (Lyons, 1996). Second, organizations balance the ex-ante costs of designing complete contracts with the ex-post costs of less exhaustive arrangements (Crocker & Masten, 1991). Whereas ex-ante costs may include time-, negotiation- and management costs in searching for information to craft a detailed contract, ex-post costs include opportunistic behavior and renegotiation costs. However, even in cases of low ex-ante costs of drafting detailed contracts, contracts may still be incomplete. This incompleteness is purposeful (Bernheim & Whinston, 1998): these contracts contain gaps that could have easily been covered, but have been left open for purposes of flexibility. Thus, incomplete contracts do not stipulate all obligations and actions and therefore are characterized by flexibility in the arrangements (Al-Najjar, 1995; Argyres, Bercovitz, & Mayer, 2007; Bernheim & Whinston, 1998; Crocker & Reynolds, 1993), which can be favorable for innovation.

The PBC is one such agreement in which the parties have intentionally left the contract incomplete. As the parties focus on the performance rather than the inputs and processes, PBCs are faced with lower term specificity than for example a behavior-based contract, which describes how to deliver the transaction (process) and which resources to use (inputs). Further, with PBCs, partners are rewarded based on the performance they deliver. The behavior-based contract in contrast rewards the partner for the processes they carried out and the resources they used in these processes. As such, PBCs are characterized by two dimensions, *low term specificity* and *rewards that are linked to performance*, which are viewed by various scholars as the key underlying characteristics of a PBC (Ng & Nudurupati, 2010; Else, Groze, Hornby, Mirr, & Wheelock, 1992; Martin, 2002; Lamonthe, 2004; Hypko, Tilebein, & Gleich, 2010). For example, studies from the logistics sector, also known as performance-based logistics (like Doerr, Lewis, & Eaton, 2005; Ng et al., 2009; Ng & Nudurupati, 2010), define a PBC as a contract that 'describes and communicates measurable outcomes rather than direct performance processes' (DoD, 2002, p. 1). Studies in healthcare underline the importance of an additional, above-the-baseline (i.e. fixed pay) compensation based on measures of quality of care and treatment outcome (Lindkvist, 1996; Lu, Ma, & Yuan, 2003; Shen, 2003). Hence, the focus of the contract is on the performance and rewards are in turn linked to the performance. In the following section we will outline how such contracts affect innovation.

### 3 The Role of Performance Based Contracts in Innovation

Our review of extant literature did not reveal any papers that specifically focus on how performance-based contracts affect innovation. We therefore turned to general contracting literature and found two papers that relate contractual detail to innovation (Johnson & Medcof, 2007; Wang et al., 2011). For example, Johnson and Medcof (2007) state that specification of outcomes to be accomplished leaves agents with latitude for innovation. Wang, Yeung and Zhang (2011) argue that contracts provide a



legal and institutional framework, which curbs opportunism and improves innovation performance. We build on these two contributions to argue how term specificity affects innovation. Furthermore, Johnson and Medcof (2007) also discuss the effects of rewards on innovation, albeit in an *intra-firm* setting where the principal is the firm and the agent is a separate division of the organization. Research on the effects of rewards on innovation in an *inter-firm* setting is limited. Nevertheless, management pay literature contains a significant number of papers that use agency theory to study the effects of rewards on relationship outcome, such as performance and innovation (e.g., Bloom & Milkovich, 1998; Makri, Lane, & Gomez-Mejia, 2006; Roth & O'Donnell; Stroh, Brett, Bauman, & Reilly, 1996). As such, in order to outline the effect of the second dimension of a PBC (i.e., partner pay) on innovation in an IOR context, we lend our arguments from the management pay literature by using only those papers whose reasoning can naturally be interpreted in terms of inter-firm transactions.

According to Wang, Yeung and Zhang (2011), innovation is a structured, knowledge-intensive activity which is embedded in networks that span across organisational boundaries. Moreover, these authors emphasize the role of co-creation with the partner in innovative activities. Johnson and Medcof (2007) define innovation as discrete, proactive undertakings by agents that advance new ways for organizations to use or expand their resources. Whereas the focus of Wang et al., (2007) is on the process of getting innovations and the role of co-creation with the partner, Johnson and Medcof (2007) emphasize innovation as an outcome of the relationship. As such, in line with Johnson and Medcof (2007), we define innovation as proactive initiatives taken by a partner to improve or advance new ways of delivering the transaction as perceived by the contracting organization. In the following sections we will outline our reasoning as to how the effects of the two characteristics of PBCs on innovation occur.

### **3.1 Low term specificity**

Low term specificity resonates with the contractual incompleteness dimension of not specifying all verifiable obligations and actions of the parties. Term specificity is the extent to which terms and clauses are specified in detail (Luo, 2002). Wang et al. (2011) refer to this as contractual detail, and argue that well-specified contracts reduce the costs and risks associated with knowledge exchange and collaborative innovation. Viewing this line of reasoning in the light of incomplete contracts, we argue that contracts that are less complete foster innovation. The PBC is characterized by *low* term specificity as the focus in these contracts is on the desired performance, not on prescribing specific actions or resources to be used by the partner. Partners therefore have the freedom to do their work in whatever way they consider best, and to determine their procedures within certain boundaries (Johnson & Medcof, 2007; Wang et al., 2011). These boundaries relate to achieving the desired performance, possibly complemented by certain conditions.

As such, an important element in PBCs is the clear separation between the organization's expectations (i.e. performance goal) and the partner's implementation (i.e. how it is achieved) (Kim et al., 2007). This focus on performance, rather than the processes and resources to be used, can be understood as an attempt to allow for greater flexibility (Al-Najjar, 1995) and latitude (Johnson & Medcof, 2007). For example, a PBC in the maintenance industry might describe such things as the timing of the maintenance, amount of payment for the uptime of the machine, what to do in case of breach of contract, and so on. However, the contract may e.g., not describe which resources to use to maintain the machine, nor does it state which activities to undertake. Therefore, when event *x* occurs, the partner has the flexibility to adjust to event *x* and maintain the machine in any way (e.g., in a less expensive or more innovative way), as long as they meet the specified performance. Hence, the contract is incomplete in the sense that it specifies only the desired performance that the partner should achieve. The partner in turn determines *how* to achieve the desired performance, thereby maximizing provider autonomy in attaining the performance (Gruneberg, Hughes, & Ancell, 2007; Macfarlan & Mansir, 2004 as in Kim et al., 2007). Intuitively, low term specificity allows the partner more freedom in decision-making regarding the delivery of the transaction. The partner can, thus, choose which activities to engage in and which resources to use at their own discretion. As such, for contracts that are characterized by low term specificity, partners have a higher degree of autonomy.

In order to effectively engage in innovation, partners should not be hindered by formal and rigid rules and obligations (Wang et al., 2011). As such, autonomy is essential to the process of leveraging existing strengths and identifying opportunities that are beyond the partner's current capabilities. By granting autonomy, the degree to which a partner can shape and influence matters increases and they can quickly respond to changes. As a result, the partner can shape and influence the way the service is delivered, they can, thus, make changes to the transaction. As such, autonomy provides the partner with the freedom and flexibility to initiate innovative activities (Abbey & Dickson, 1983; Arad et al., 1997;

Morris, Kuratko, & Covin, 2007; Paolillo & Brown, 1978) and to approach problems and performance metrics in a way which makes the most of their expertise and creative thinking (Amabile, 1998; Liao, Liu, & Loi, 2010; Woodman, Sawyer, & Griffin, 1993). In addition, not stipulating how to deliver the service, or which resources to use, is important in helping to adjust to the environment, and hence, being flexible and doing things differently. The partner, who is more knowledgeable about the contracted transaction than the organization, can draw on its own experience and ideas, rather than having to conform to the actions and resources stipulated by the, possibly less knowledgeable, principal. From the various ideas generated by the partner for delivering the performance in new and improved ways, a promising activity may be identified and implemented which can result in performance improvement. Even when an innovative activity fails, both parties can share the experience and learn from it for future engagements in innovative activities (Dess et al., 2003; Shimizu, 2011).

However, too low term specificity in the contract also creates the potential for the partner to act opportunistically (Eisenhardt, 1989). Hence, even reliable partners, who are incentivized to behave appropriately through rewards being tied to performance, may not be able to resist the temptation to act opportunistically when autonomy is very high (Shimizu, 2011). Thus, the overall quality and value of the innovative activities is lower when the partner has a very high degree of freedom in deciding how to deliver the transaction or which resources to use (Shimizu, 2011). Such opportunistic activities in light of a high degree of autonomy are e.g., preparation of own competitive activities or selling the generated (innovative) knowledge to a competitor (Kloyer & Scholderer, 2012). So, similar to Wang et al. (2011) who note that too little contractual detail is not conducive for innovation, we argue that too low term specificity also hinders innovation.

Thus, low term specificity makes the partner engage in innovation as they have a certain degree of autonomy in deciding how to deliver the transaction or which resources to use. However, when term specificity is too low, partners might focus their innovative activities on their own individual objectives, thereby negatively affecting innovation (Guth & MacMillan, 1986; Shimizu, 2011). Hence, we argue:

*H1: There is an inverted U-shaped relationship between low term specificity and innovation.*

### **3.2 Rewards linked to performance**

The second characteristic of a PBC is that the partner is paid based on the performance they deliver (Kim et al., 2007). In such cases, the contract rewards the partner based on outcomes that are highly related to their efforts by incorporating incentives to meet (higher levels of) performance goals (Argyres & Mayer, 2007; Lyons, 1996). Agency theory is used as a principal theory in guiding organisational research on the effects of pay on relationship outcome (such as performance) (e.g., Bloom & Milkovich, 1998; Roth & O'Donnell; Stroh et al., 1996). Agency theory is concerned with the structuring of monitoring and compensation systems in principal-agent relationships in order to induce self-interested, utility-maximizing, risk- and effort averse agents (i.e. partners who want to maximize their compensation and minimize efforts and expenditures) to meet the goals of their principals (organizations that seek to maximize their performance) (Eisenhardt, 1989; Bloom & Milkovich, 1998).

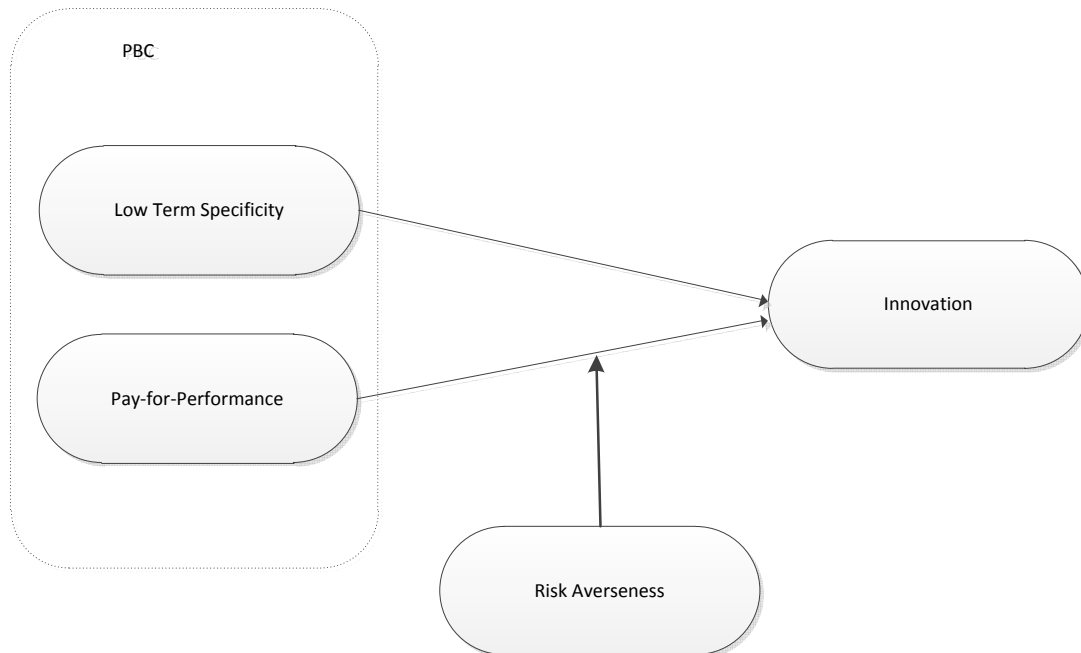
Compensation systems are a contractual mechanism through which many goals are pursued. They provide incentives to adopt efficient behavior, promote efficient adaptation, and balance different types of hazards (Furlotti, 2007). According to agency theory, if rewards are linked to behavior or resources that are used, partners will be discouraged to engage in activities that will not be explicitly rewarded (Eisenhardt, 1989; Deckop, Mangel, & Cirka, 1999), such as innovations. In these cases, the partner limits themselves to perform only those activities and behaviors that are specified in the contract for which the partner is being paid. In the most extreme case, any new initiative would be a breach of contract (Johnson & Medcof, 2007). On the other hand, when rewards are linked to performance, such as is the case in PBCs, it induces the partner to exert more effort and creates incentives to engage in (new) activities to improve performance. There is an incentive to innovate because if the partner accomplishes the contracted performance through innovative activities (e.g., by using other resources or different ways of delivering the service), the increased net profits of the activity accrue to the partner. As such, under a PBC, partners will exhibit activities that are in favor of reaching the contracted performance; they will find new and improved ways of delivering the performance to maximize their returns. They will, thus, engage in innovative activities to deliver (a higher level of) performance. Researchers agree on this and have shown that there is a positive relationship between financial incentives and opportunity identification and innovation (Abbey & Dickson, 1983; Johnson & Medcof, 2007; Shepherd & DeTienne, 2005). Put differently, the partner invests in the improvement of the performance via innovative activities, anticipating that the incentive payment will offset the investment costs (Heinrich & Choi, 2007). Hence, on the premise of the above, we hypothesize the following:

*H2a: Linking rewards to performance positively affects innovation.*

However, if the partner, for whatever reason, is not able to deliver the agreed performance, they will still bear the costs. As a result, with an emphasis on performance, rather than the process to achieve a certain result, the partner’s liability increases (Gates et al., 2004). The partner has more responsibilities and authorities and bears more risk as they are faced with uncertain income streams (Gates et al., 2004; Guajardo, Cohen, Kim, & Netessine, 2012; Gruneberg et al., 2007; Kim, Cohen, Netessine, & Veeraraghavan 2010; Ng & Nudurupati, 2010). Risk here includes among others the risk of defects, failing to meet completion deadlines, financial risk, and quality issues. As attitudes toward risk differ among organizations, the relationship stated in H2a is negatively moderated by the risk-averseness of the partner. Risk-averse organizations are willing to sacrifice some of the expected return in order to minimize their risk in outcomes (March & Shapira, 1987; Singh, 1986). They will, therefore, opt for status-maintaining decisions, by favoring solutions that have been proven to work well in the past over high-risk decisions to meet performance goals (Florian & Gustavo, 2009). Put differently, when a risk-averse partner’s payment is linked to performance, the partner may take conservative decisions and establish greater cost control at the expense of creative freedom in reaching the performance. Eventually, this may result in fewer resources being devoted to innovative activities, as innovation is inherently risky (Bloom & Milkovich, 1998; Makri, Lane, & Gomez-Mejia, 2006). To put it in Eisenmann’s (2002) words; to improve the odds that agents (i.e. partners) will meet performance targets, agents choose to avoid risky projects (i.e. innovative activities). On the premise of the above we expect that the more risk-averse a partner is, the weaker the positive effect of rewards-linked-to-performance on innovation. Accordingly, we propose the following hypothesis:

*H2b: The positive effect of rewards linked to performance on innovation is weaker for risk-averse partners.*

Figure 1 shows our conceptual model, which describes the more subtle processes that we expect to lie at the root of the causal relationship between PBCs and innovation. We argue that PBCs are characterized by low term specificity and rewards that are linked to performance. By having low term specificity, i.e., not stipulating how the partner should deliver the performance and which resources to use, the partner is faced with a certain degree of autonomy which positively affects innovation. It is important to note however that the relationship between term specificity and innovation follows an inverted U-shape: when term specificity is too low, its positive effect on innovation will be reduced. Furthermore, we argue that when the partner is paid based on the performance, the partner will engage in improvement and innovation activities. However, though paying for performance positively affects innovation, we postulate that this effect decreases when the partner is risk-averse.



**Figure 1 Conceptual Framework**

Although extant research has mostly addressed the negative effects of incomplete contracts on relationship outcomes, this research focuses on a positive effect of incomplete contracts, i.e., innovation. More specifically, we argue why and how a specific type of incomplete contract, namely the performance-based contract (PBC), fosters innovation. Various authors have suggested this effect (Kim et al., 2007), yet have failed to uncover why and how this effect may occur.

In contrast to prior studies, which usually have been grounded in a single theoretical perspective, we draw on both agency- and transaction cost theory of contractual governance to understand the effects of (incomplete) contracts in general, and PBCs in particular, on innovation. Building on transaction cost- and agency theory, we argue that PBCs are characterized by low term specificity and rewards being linked to performance and put forward a conceptual model that links these two characteristics to innovation. We hypothesize that there is an inverted U-shaped relationship between term specificity and innovation. Low term specificity induces the partner to take its own decision concerning how to deliver the transaction and which resources to use. By granting this autonomy, the partner enjoys the freedom and flexibility to engage in innovative activities. However, too much autonomy may lead the partner to modify their innovative activities in their own interest, which could result in lower value for the organization. We draw on agency theory to argue that linking rewards to performance positively affects innovation as the partner induces more effort to engage in (new) activities to deliver (a higher level of) performance. We also argue that this relationship is negatively moderated by the partner's degree of risk-averseness.

One implication of this model that seems worthy of future research is that there is an optimum level of term specificity that maximizes innovation. Thus, while organizations should be willing to invest in designing a contract that is conducive for innovation rather than a maximum shield from hazards, term specificity should not be too low, as that would lead partners to employ their innovative activities for their own individual objectives. Future research could seek to determine the optimal level of term specificity, in relation to possible contingencies like, for example, service type and type of industry. More specifically, throughout this paper we have strengthened and illustrated our arguments with evidence from a number of actual contracts and interviews from the IT industry. The relative importance and relevance of the issues revealed by the contracts and emphasized in the interview may differ across industries. Therefore, the conceptual model first needs further testing. Furthermore, we state that the effect of PBCs on innovation is lessened the more risk-averse the organization is. Hence, an important extension of this research would be to test whether the gains of innovation outweigh the risks the partner is faced with, as PBCs are unlikely to foster innovation if this is not the case. Finally, another important aspect of contracts in general is the use of specific incentives to motivate the partner to engage in innovation. Such mechanisms, which are independent of pay-for-performance, were not considered in our framework. Such incentives are e.g., financial bonuses, the possibility to extend the contract if the partner engages in innovation and the use of innovation budgets. Such incentives could offset the risk the partner is faced with when engaging in innovative activities. This could have important implications for the effects of contracts on innovation and is thus worthy of future research.

One important limitation of our research relates to the fact that it focuses on the effects of formal control on innovation and therefore does not address other important factors that may influence innovation in an IOR, such as relational governance modes. More specifically, IORs in which incomplete contracts, such as PBCs, are used rely on complementary instruments of governance, such as relational governance (Al-Najjar, 1995). Relational governance can be used to overcome ex-post problems resulting from incomplete contracts. Thus, next to having a sound contract governing a relationship, relational attributes like trust, communication and commitment should be emphasized as well (Mohr & Spekman, 1994; Morgan & Hunt, 1994). These attributes could affect innovation. To illustrate; communication involves close interaction between individuals across the collaboration interface that might result in the sharing of know-how (Kale, Singh, & Perlmutter, 2000). This knowledge sharing can positively affect innovation (Im & Rai, 2008). Future research could therefore seek to explore in a more detailed manner the interaction between (performance-based) contracts and relational governance elements, such as trust.

#### **4 Conclusion**

A second limitation regards the fact that this research does not address partner selection. That is, we focus on the effects of contracts on relationship outcomes whereby the organization and its partner are given. However, the characteristics of this partner may strongly influence outcomes such as innovation.

For example: one partner may engage in innovation more often than others, or a partner's workforce may be highly used to continuous innovation. These phenomena may occur irrespective of which type of contract is governing the IOR. Hence, future research could include partner selection in studies of incomplete contracts on relationship outcome.

As more and more organizations are moving toward the use of incomplete contracts to capture the benefits of innovation, a better understanding of how to design, implement, manage, and control contracts that are conducive for innovation, is critical for today's business. Nevertheless, such contracts require different governance mechanisms. Being able to manage and control the inter-organisational relationship by means of an incomplete contract, such as the PBC, is a valuable source for capitalizing on a partner's innovation capabilities. This research provides a valuable first step towards managing inter-organisational relationships through an incomplete contract by postulating how contractual characteristics may affect relationship outcomes.

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# The Present Situation, Problems and Countermeasures of High Level Science-Technology Talents: A Case Study of Wuhan City of China\*

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**Abstract:** It is a strategic task to construct a team of high level science-technology talents today. As a case of Wuhan, taking the national related document materials and empirical data, the paper analyses the current situation and present problems of high level science-technology talents. Finally, as a guide of today talent policies and talent planning some development countermeasures of high level science-technology talents in Wuhan city of China i.e. being-three-in-one solutions of introducing, training and using talents have been proposed.

**Key word:** High level Sci-Tech talent ; Statistical analysis-comparative method; Development solution

## 1 Introduction

High level science-technology talents with rich professional knowledge and higher academic achievements, are engaged in creative work, play the leader or the leading role, and make outstanding contributions to scientific and technologic development and progress<sup>[1]</sup>. They are the core force of scientific and technological progress, and the intellectual support of building a comparatively well-off society.

Wuhan is a center city in the central area of China. In the period of the “Eleventh Five-Year”, some opportunities have been firmly grasped, such as the strategies that central area should develop first, Wuhan city circle’s TWO TYPE society; the Power City of Talents Strategy has been vigorously implemented, the talents has achieved remarkable development. However, with more intense competition between countries and regions, talents become more and more important. Now, there is still a large distance of high level science-technology talents between Wuhan and the first-tier benchmark cities i.e. Beijing, and can not meet the needs of economic and social development. In the next ten years there are many strategic opportunities in Wuhan to build a moderately prosperous society and take the lead in realizing modernization; It is also a critical period to develop talents for Wuhan. The current treasury plan is to build a high-quality science-technology talent team, agglutinating a number of strategic scientists, high-end innovative entrepreneurs and leaders. So followed the law of science-technology talent growth and the path from introducing, training, developing and managing talents, high level science-technology talent countermeasures in Wuhan should be studied.

## 2 The Current Situation of High Level Science-technology Talents in Wuhan

### 2.1 Overall development scale

From the end of “Tenth Five-Year” to the end of 2009, all kinds of talents in Wuhan from 1.07 million to 1.512 million; the average annual growth rate was 10.3 percent, over 3.6 percent of the expected goal. Professional and technical talents grew from 598.3 thousand to 921 thousand . Highly skilled talents grew from 197.3 thousand to 212 thousand. In the end of 2009, In Wuhan there were 101 independent research institutions, 139 post-doctoral research stations; 80 thousand scientific and technological activities people, 57 academicians, and 99.4 thousand graduate students . At the end of 2007, In Wuhan there were 467 young experts who had made outstanding contributions, 1988 people who shared special government allowances, 218 talents who were the candidates of national, provincial and municipal high level talent project.

### 2.2 Overall development trend

The proportion of Wuhan’s talent resources dividing the total human resources was 23.4 percent in 2009; the proportion of the high-educated people in all the labor population was 25 percent, the contribution rate of talents was 25 percent, the proportion of highly skilled talents among skilled workers was 25 percent. In 2009, in Wuhan there were 72 thousand R&D people, in which 33

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\* The fund project of soft science research plan of Wuhan in 2010: the mechanism and development countermeasures of introducing-training-managing high level science-technology talents in Wuhan (201040333112-03)

thousand people had bachelor's degree and above, accounted for 46.1 percent; measured by the actual working hours, the R&D people had 46.4 thousand years, the researchers with intermediate professional titles and above or doctoral degrees had 26.5 thousand years, accounted for 57.1 percent. In 2009, in Wuhan there were 703 R&D institutions, 22.5 thousand years people engaged in R&D activities in institutions, they were 2.1 times of 2000; there were 8.5 thousand doctoral and master talents, accounted for 38.0 percent <sup>[2]</sup>.

In 2010, there were 1450 national science-technology projects, 665 municipal science-technology projects, 15 municipal registered science-technology achievements, and 376 awarded science-technology achievements, 28 national prizes <sup>[3]</sup>; applied and granted patents, technology turnovers were higher than Zhengzhou and Changsha. (Table 1)

**Table 1 Scientific and Technological Achievement Situation of 4 Province Capital Cities In 2010**

city	patent applications (thousand pieces)	patents granted (thousand pieces)	technology contracts (million Yuan)
Wuhan	15.045	10.165	8887
Nanjing	19.275	9.150	7689
Zhengzhou	8.000	5.600	4300
Changsha	9.071	6.209	2354

Note: table data from national economic and social development statistical bulletin of each city in 2010.

### 2.3 The sustainable development supporting ability

Until the end of 2010, in Wuhan there were 78 colleges, ranked 2, second only to Beijing; graduate students, an important scientific research force, had increased from 80.1 thousand in 2008 to 99.4 thousand in 2010, the scale was larger than such capital cities as Nanjing, Guangzhou, Changsha, Zhengzhou and Xi'an; the growth rate of graduate students was 13.6 percent, it was in the first place in eight cities (Table 2). Vigorous development of higher education and rapid growth of graduate students significantly support sustainable development of human resources in Wuhan.

**Table 2 Universities and Graduate Students of Some Cities in 2010**

city	university	the number of graduate students (thousand people)	the growth rate of graduate students
Beijing	89	225	7.65%
Shanghai	66	111.7	7.92%
Guangzhou	77	65.9	9.65%
Nanjing	53	87.3	9.1%
Zhengzhou	48	16.8	7.1%
Changsha	48	46.3	7.2%
Xi'an	49	77.0	6.35%
Wuhan	78	99.4	13.6%

Note: table data based on the economic and social development statistical bulletin of each city in 2010.

### 2.4 Innovative platforms and favorable policies

Wuhan has always attached great importance to science-technology innovation; the strategy of "Technology-built City" was firstly proposed in 1987. In Wuhan the capital generously supports the introduction of high level science-technology talents, and livelihood security highlighted in such full range as housing, living allowance, spouse placement and their children to school, the "green channel" for high level talents to own senior professional titles has been opened, entrepreneurial talents could enjoy the favored policies of "low threshold, zero down payments, no rules". And then, many R&D carrier platform, the "Special Administrative Region of Talents", i.e. East Lake High-tech Zone, are playing the aggregation function of chief scientists and R&D talents at home and abroad.

After some years' accumulation, some high-tech industries and the industrial groups, based on electronic information, new materials, biotechnology and new medicine, the integration of optical, mechanical and electronic, and modern equipment manufacturing have initially formed and affect great impact on the whole country in Wuhan. At the end of 2008, East Lake High-tech Zone had totally attracted more than 1300 overseas talents, founded more than 520 enterprises that involved more than 200 high-tech projects' research and business. The first batch of "3551 Talents Scheme" has attracted 14 high-level overseas talents since 2010, and the amount of subsidy is up to 36 million Yuan.

## 3 The Main Problems of High Level Science-Technology Talents in Wuhan

### 3.1 The insufficient total amount

Science-technology people are the main body of science-technology talents. In 2008 there were 73 thousand science-technology people in Wuhan, in Beijing 486 thousand, 6.7 times of Wuhan; and in Shanghai 288 thousand, 3.9 times of Wuhan; in Guangzhou 82 thousand, 1.1 thousand more than Wuhan. Scientists and engineers are the main force of science-technology people. In 2008, there were 55 thousand in Wuhan, 389 thousand in Beijing, 7.1 times of Wuhan; and 179 thousand in Shanghai, 3.3 times of Wuhan; 179 thousand in Guangzhou, 4 thousand more than Wuhan. In Beijing there were 732 Academicians in 2008, 72 in Shanghai, and only 56 in Wuhan, a wide gap between Wuhan and other developed cities.

### **3.2 The unreasonable talent structure and unbalanced distribution**

Firstly, the structure of ability level is irrational, severe shortage of strategic scientists, high-end innovative entrepreneurship, leading talents and top-notch creative talents. Secondly, the knowledge structure and professional structure are unbalanced, especially shortage of specialized talents in the characteristic key industries i.e. advanced manufacturing, modern services and strategic emerging industries in Wuhan. Thirdly, the industry distribution is irrational, and the structural contradictions are prominent. A large number of high level researchers are in universities and research institutes, many enterprises, especially small and medium private enterprises are lack of qualified technical staff and high level key personnel. Fourthly, talents are aging. At the end of 2009, In Hubei province there were 56 academicians, in which 49 people over the age of 60, accounted for 87.5 percent, only 3 young academicians in the age of 50, accounted for 5.36 percent.

### **3.3 The not strong talent innovative ability**

It is mainly reflected in the independent innovation and independent R&D capabilities of enterprises. Now, most high-tech enterprises' development tasks in Wuhan have been finished by the co-operation with domestic universities and research institutes. It is not obvious to play a leading role of Enterprises' intellectual rights, core technological products, high-tech products and output value in industry development.

### **3.4 The not strong ability of gathering and recruiting talents**

GDP is a common indicator to measure a country's or an area's economic comprehensive level. Wuhan's comprehensive level reflects its ability of science-technology input and contribution to some extent. GDP of Beijing in 2010 was 1.37 trillion, Shanghai was 1.68 trillion and Guangzhou was 1.06 trillion, but Wuhan's GDP was only 551.57 billion. Visibly, Wuhan's GDP was far below some first-tier benchmark cities. At present, in Wuhan more favorable talent policies with preferential treatment and good working environment have been presented to introduce talents, but due to the gap of economic development level high level science-technology talents still give priority to first-tier benchmark cities.

### **3.5 The imperfect talent management system and mechanism**

In the geographical conditions, there are advantages in Wuhan about universities, research institutions and the amount of all kinds of talents among big cities of the whole country. However, the phenomenon, that outflow of science-technology talents is more than the inflow, is objective. Besides the differences in the level of economic development from the benchmark cities, the old concept, the inadequate system, the not live mechanism, the uncomfortable environments and the not enough services, restrict the development of talents, especially the imperfect management system and mechanism of talents. The flow of talents lacks regulated policies and effective balanced mechanism, talent selection and appointment competition mechanism are not perfect, the talent evaluation system is still not established fully, talent planning of all trades and professions has such inferiorities: not accurate positioning, unclear target, unfit with the actual and economic standard, not pragmatic policy.

## **4 The Development Countermeasures of High Level Science- Technology Talents in Wuhan**

### **4.1 The establishment and perfection of a policy and institutional system based on the trinity of introducing-training-using talents**

The policy and institutional systems include the access policy, the favored policy and the reuse policy for the introduction; financial support, preferential taxes and insurance policy for talents' innovation and entrepreneurship; rational flow policy; the public service policy; development and management policy; training and encouragement policy for backup high level science-technology talents; the policy of selecting high level talents at home and abroad; innovation performance oriented and quality oriented scientific research evaluation system and science- technology talents evaluation system; the distribution system based on the production factors such as labor, capital, technology, management

by their contribution.

## **4.2 The optimization of growth environment based on the trinity of introducing-training-using talents and the creation of atmosphere to satisfy talents near and far**

### 4.2.1 The optimization of business environment

Positively providing opportunities and conditions for the high level science-technology talents can make them do their best to work and achieve their value. The specific measures are as follows: establishing talents' funds in government budget to give priority to ensuring the input of talents' introduction, training, selection and motivation; paying attention to the key positions and excellent top-notch talents in terms of R&D funds, equipment and staffing; helping science-technology talents in terms of market access, business platform, finance and taxation support, and finance guarantee service system<sup>[4]</sup>; improving the systems of research management, technology evaluation and rewarding regulations in accordance with the laws of scientific research.

### 4.2.2 The improvement of living and cultural environment

1) The optimization of living environment. In the way of combining rental and monetary subsidies, different levels and forms of housing support system should be established to meet the housing need of the outstanding talents, industrial leading talents and young talents in Wuhan. In 5-10 years, by the way of buying back, vacating, transformation and leasing, 100 sets of "celebrity home" free of charge for world-class outstanding talents to live in; 1000 units of "elite community housing" to rent for industrial leading talents; by the policies of limiting commercial houses and public rental housing, and providing appropriate monetary subsidies, 10000 sets of "talents apartment" for young talents to rent and turn over.

2) The optimization of medical environment. The public health and medical service system should be strengthened; excellent medical and healthy talents and the backbone of general practitioners should be cultivated. The others include improving the level of medical services, increasing talents' medical insurance, encouraging enterprises to give healthy and accident insurance to science-technology talents.

3) The optimization of educational environment. The key way should solve the problem of children's education of all kinds of talents. That needs actively creating conditions to foster high quality educational resources to facilitate all kinds of talents, especially overseas children to study.

4) The optimization of cultural environment. City cultural atmosphere should be innovative, tolerant, unity and harmony, healthy and livable.

### 4.2.3 The optimization of service environment

That includes establishing a unified and standardized labor resources market to play the basic role of allocating talents to a greater extent; perfecting information-sharing mechanism of talents; improving registration, statistics, and releasing mechanism of talents' supply and demand information, and the discovery and evaluation mechanisms of talents; energetically developing the human resources service industry to provide human resources market's allocation with full service carrier and platform; effectively playing the role of the talents service industrial associations; deepening the reform of household registration system to play the positive role of a census register and residence permit in attracting talents.

## **4.3 The establishment of mechanism based on the trinity of introducing-training-using talents**

### 4.3.1 The establishment of mechanism of introducing *rigidly* and flexibly

(1) The innovation of the way of high-end talents' introduction, combining flexible introduction and rigid introduction. That includes lowering the entering threshold, opening up the "green channel" for the flexible introduction, playing the main role of enterprises and other employing units, broadening the channel of the social groups and talent intermediary service agencies, encouraging domestic and foreign senior talents to work in Wuhan for a long or a short term in project cooperation, investigation, lectures and other forms, and supporting the enterprises and institutions to introduce talents at home and abroad flexibly by the way of consultation, lecture, part-time, short-term employment, technical cooperation and talents leasing.

(2) The innovation of the way of high-end talents' communication and cooperation and selecting talents in the international and domestic markets. That includes aiming at the forefront in the world; promoting the local professionals and technical talents to participate in the international cooperation, training and exchanging; implementing the "Yellow crane Talent Plan" and establishing liaison station to introduce foreign high level talents; introducing and breeding a lot of international talent intermediary service agencies.

(3) The building of the displaying platform to attract and keep high level talents. For instance,

implementing preferential entrepreneurship policies for high-level talents at home and abroad, strengthening the construction of future science-technology city and Chinese science-technology industrial park, establishing distinguished experts system, perfecting the honor system such as “Yellow Crane Friendship Award” and “Honorary Citizen” in Wuhan.

#### 4.3.2 The establishment and improvement of development mechanism of high level scientific innovative talents

1) The highlight of training focus. That includes implementing the training plans of urgent professional technical talents; starting the development plans of some high-end talents in the field of advanced manufacturing, modern services, strategic emerging industries and other key industries; drawing and implementing the constructive views of innovative science-technology talent team; setting up the innovative science-technology talent policy systems with a definite target, clear layer, close convergence; constructing a number of high level innovative talent training bases by the key enterprises, major projects and technical tasks; training a number of independent innovative leading talents and high level innovative teams with significant influence.

2) The combination of the echelon culturing and team training, and optimization of talent ecological structure. It includes improving young talents' training program, the morning program and academic leaders plan; training young innovative technological professionals; speeding up the construction of high level innovative teams to form a joint force's advantage; shortening the growth process of innovative science-technology talents.

3) The combination of the educated training and practice, and the improvement of talents' capacity and quality. That is establishing and improving multi-level, multiple types of high-quality talents' training system and lifelong learning educational systems, taking a variety of developing measures of combing job training and off-job training, international and domestic training; Strengthening the cooperation of enterprises, universities and research institutions in talent training and constructing various strategic alliances with the main bodies of enterprises and the guidance of markets; implementing the cultural model of talents project, developing high level innovative science-technology talents by the way of building laboratories and research centers together, cooperating in education and jointly implementing major projects; encouraging enterprises, universities and research institutions to construct post-doctoral research stations (industrial bases) and technical centers; encouraging academicians to cooperate in research projects and train talents.

#### 4.3.3 The establishment and perfection of an efficient management system of high level innovative science-technology talents

1) The Innovation of the mechanism of using talents and monitoring status, and improvement of talent using efficiency. That includes updating the concept of employing talents, in the people-oriented concept, respecting knowledge and talents, using talents flexibly; making evaluation and assessment standards of scientific talents; creating dynamic information database of talents' inflow and outflow; keeping talents by the feeling and cause, improving the system of major decision consulting experts, knowing talents' working and living conditions; establishing an open and flexible talents' flowing and configuration mechanism.

2) The improvement of the talents' incentive mechanism. The main way is allowing to take the negotiation wage system between talents and employers, strengthening the talent wage decision right of employers, especially taking annual salary system, agreement wage system, the rewards system of science-technology achievements and other forms, i.e. the wage closely associated with the performance and contribution.

3) The improvement of the personnel service mechanism and efficiency. A public service platform about the employment registration of enterprises, management of talent records, mediation and arbitration of labor and personnel dispute, employment services should be set up; an information resource statistics and database should be constructed; The laws of talent protection, talent market management and talent developing management should be perfected.

## 5 Inclusion

The high level innovative scientific and technological talent, an important part of talent team, is the creator of new discipline and the inventor of new technologies, is the pioneer and leader in science and technology innovation, has great significance to national economic and social development. Only first does a high level innovative scientific and technological talent team be set up, the effect of a point to affect the whole situation can rise. The study in the paper on the current situation, problems and

development countermeasures of high level science-technology talents will be a guide and greatly benefit to the talent progress of Wuhan.

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# Research on the Correlation Between Psychological Capital and Turnover Intention

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**Abstract:** First, the thesis generalizes the relevant literature about psychological capital home and abroad. Secondly, the author brings out the thesis's research conceptualization and hypotheses, and then the thesis sets the Chinese workers as the research object, using questionnaire survey and statistic analysis, verifies the follow relations: the employees' psychological capital and resiliency have significant negative correlation with turnover intention; The employees' hope level and optimistic level have negative correlation with turnover intention, but not significant.

**Key words:** Psychological capital; Turnover intention; Hope level; Optimistic level

## 1 Introduction

The research on psychological capital in the domestic and foreign has just started, especially in domestic. In foreign, the concept of psychological capital first appeared in documents involved economics, investment and sociology. Summarizing all kinds of scholars' points, we can find there are three aspects about the concept of psychological capital: Trait theory, namely psychological capital exist as individual inner qualities, with Hosen(2003), Letcher(2004), Cole(2006) as its leading exponents; State theory, namely psychological capital is a kind of specific positive psychological state, with Goldsmith(1997), Tettegah(2002), Luthans(2005) as its leading exponents<sup>[1]</sup>; Comprehensive theory, namely psychological capital is a kind of psychological quality which both has trait characteristic and state characteristic, with Snyder(2000), Bandura(2003), Avolio(2006) as its leading exponents<sup>[2]</sup>.

The author believes that there are inner connections between psychological capital and turnover intention based on the existing research results. So the author uses the concept of the psychological capital and the questionnaire designed by Luthans(2005) and his fellows who defined psychological capital as "The core mental element of individuals which is beyond the human capital and social capital to arise general enthusiasm, shown in details like mental statements in accordance with the standard of the optimistic behavior. One can obtain advantages through this by targeted investment and development." <sup>[3]</sup> brings out the thesis's research hypotheses, tries to analyze the connections between hope level, optimistic level, resiliency, psychological capital and turnover intention.

## 2 Research Hypotheses

According to research the author raise the following hypotheses:

Hypothesis 1: Employees' hope level has negative correlation with their turnover intention, but not significant.

Hypothesis 2: Employees' optimistic level has negative correlation with their turnover intention, but not significant.

Hypothesis 3: Employees' resiliency has significant negative correlation with their turnover intention.

Hypothesis 4: Employees' psychological capital has significant negative correlation with turnover intention.

## 3 Questionnaire Design and Survey

The author adapts the scale from the psychological capital questionnaire by Fred Luthans (2005) in the research of Chinese staffs which is translated and modified independently<sup>[4]</sup>. then designs the scale of the psychological capital which consists of three parts: hope, optimism and resiliency. The hope part consists of 6 questions which are developed by Snyder, Higgins, Symptom etc and have been widely used in all kinds of different background. The optimism part consists of

10 questions which are from Life Orientation Test (LOT) which are developed by Scheier and Carver in 1985. The resiliency part consists of 14 questions are developed by Blcok and Kremen in 1996. According to the needs of statistics and analysis, the standard-scored sum of the 3 variables including hope, optimism and the resiliency is supposed to be the measured value of psychological capital. The questionnaire is evaluated by a 5-Likert scale<sup>[5]</sup>. These scales have been so widely used that we believed in the validity of it. We test the reliability of the questionnaire by using the Cronbach internal consistency and Reliability coefficient and split-half reliability. Generally speaking, a reliability coefficient above 0.90 is very good and the basic level is above 0.70. It has been tested that the split-half reliability and the coefficient of Cronbach's  $\alpha$  of these three questionnaires are both above 0.70, it is obviously that the consistency has been good.

**Table 1 The Reliability of The Psychological Capital Questionnaire**

	split-half reliability	the coefficient of Cronbach's $\alpha$
hope level	0.787	0.787
optimistic level	0.763	0.763
resiliency	0.705	0.705

The Turnover Intention Scale is based on the questionnaire of turnover study which is designed by Mobley(1978),and it has 8 questions in total. The questionnaire is evaluated by a 5-Likert scale. The main test indicators are the KMO sample measure and the Bartlett's sphere inspection square which are used to analyze the exploratory elements about the turnover intention. The test results showed that the KMO of The Turnover Intention Questionnaire is 0.592 while the significance of the Bartlett's is 0.0001, which is in accord with the standard of performing the elements analysis perfectly. It has been tested that the coefficient of Cronbach's  $\alpha$  of The Turnover Intention Questionnaire is 0.724, it is obviously that the consistency has been good.

To make sure of the convenience of collecting the questionnaire and the accuracy of the results, The author distributed the questionnaires via email. In total,150 questionnaires were distributed, among which 138 were returned and 127 were valid.

#### 4 Analyses of Relationships between Hope level, Optimistic level, Resiliency, Psychological Capital and Turnover Intention

##### 4.1 The correlation analysis between hope level, optimistic level, resiliency, psychological capital and turnover intention

Studies show that Employees' psychological capital has significant negative correlation with turnover behavior on their initiative, namely the higher level of the positive psychology capital, the lower rate of the initiative turnover behavior, but the Employees' psychological capital has not significant correlation with turnover involuntarily(Avey,2006). Now we are trying to analyze the connections between hope level, optimistic level, resiliency, psychological capital and turnover intention. The SPSS13.0 has been used and the correlation matrix of each variable is shown below:

**Table 2 The Correlation Matrix of Each Variable**

	hope level	optimistic level	resiliency	psychological capital	turnover intention
hope level		0.07	0.259(*)	0.544(**)	-0.109
optimistic level	0.07		0.032	0.449(**)	-0.048
resiliency	0.259(**)	0.032		0.812(**)	-0.302(**)
psychological capital	0.544(**)	0.449(**)	0.812(**)		-0.285(**)
turnover intention	-0.109	-0.048	-0.302(**)	-0.285(**)	

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\* . Correlation is significant at the 0.01 level (2-tailed).

We can come to the following conclusions from the above table:

1) The hope level of staffs has negative correlation with their turnover intention, but not significant, and the Correlation coefficient is -0.109, hypothesis 1 has been proved.

2) The optimistic level has negative correlation with their turnover intention, but not significant, and the correlation coefficient is -0.048, hypothesis 2 has been proved.



3) The resiliency has significant negative correlation with their turnover intention, and the correlation coefficient is -0.302, hypothesis 3 has been proved.

4) The psychological capital has significant negative correlation with their turnover intention, and the correlation coefficient is -0.285, hypothesis 4 has been proved.

#### 4.2 The regression analysis between hope level, optimistic level, resiliency, psychological capital and turnover intention

And now we continue to certify the connections between hope level, optimistic level, resiliency and the combination of those three. We are still doing analysis of regression with those four variables. The analysis of regression is divided into two parts: first, the three variables which are all integrated of order one will be put into one model; next, the hope level, optimistic level, and resiliency will be replaced by psychological capital in the model. We wish to find out whether the hypothesis 4 is true. And the analysis results are shown in the table below:

**Table 3 The Regression Analysis Results of Organisational Identity**

model	variables	unstandardized regression coefficient	standardized regression coefficient	t	Sig.	R	R <sup>2</sup>	F	Sig.
		B	Beta						
1	constant	23.863		6.405	0.000	0.306	0.093	3.369	0.022
	hope level	-0.030	-0.030	-0.302	0.763				
	optimistic level	-0.032	-0.037	-0.380	0.705				
	resiliency	-0.139	-0.293	-2.942	0.004				
2	constant	24.928		7.537	0.000	0.285	0.081	8.847	0.004
	psychological capital	-0.095	-0.285	-2.974	0.004				

In the first model from the chart above we are trying to put the three variables into one regression equation, after that we will notice the model works well with the coefficient of determination R<sup>2</sup> to be 0.093, F to be 3.369 and significance level to be 0.022<(0.05), which has statistical significance. The standardized coefficients of the three variables are -0.03,-0.037 and -0.293. After test the variable t we find that the resiliency is quite obvious while hope level and optimistic level are not obvious which is in accordance with the results from above the correlation analysis. Therefore, it just further proofs that the resiliency has significant negative correlation with their turnover intention, hypothesis 3 has been proved.

In the second model, the hope level, optimistic level and resiliency had been replaced by psychological capital and we may find out the coefficient of determination R<sup>2</sup> in the model is 0.081, figure F of statistical test is 8.847 and significance level is 0.004<(0.05), which has statistical significance. Meanwhile, the standardized coefficient of psychological capital is -0.285, the significance level of t is 0.004< (0.01) which means that psychological capital has significant negative correlation with their turnover intention, hypothesis 4 has been proved, and psychological capital could be a explanatory variable to staffs' organisational identity as a macro-variable.

## 5 Conclusion

This study emphasizes the state of mind of employees about the influencing factors of their turnover intention, which is the most difficult factor to catch of all influencing factors of employees' turnover intention. So, the research is aimed at attention to the factor, this is also the significance of this paper. This study shows employees' psychological capital and its structural elements are observably correlated with turnover intention. Therefore, enterprises should pay high attention to the capital characteristics of employees' psychological capital, and use methods of training, making rules, setting up reasonable tasks and etc to improve the staff's overall psychological capital level by the employees' hope level, optimistic level and resiliency. Our research also has many shortcomings, like numbers of subjects are not enough and questionnaires are the translations of foreign scale.

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# Analyzing Organisational Innovation and Deviation Phenomena by Agent Based Simulation and Case Design

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**Abstract:** This paper describes a new methodology for analyzing organisational innovation and deviation phenomena by combination of agent based simulation and case design. Organisational deviation is inextricably linked to innovation, because they are activities in business firms to break standards in operations. However, it is assumed that the former and the latter are different in terms of external utilities. Under the assumptions, we have developed a unified agent based model and have made simulation for analyzing the emergence process of innovation and deviation. The simulation results are confirmed through manual simulation and case analysis in order to obtain an in-depth understanding of inextricably linked organisational phenomena, and to distinguish the similarities and differences between innovation and deviation.

**Keywords:** Agent based model; Organisational simulation; Organisational Deviation; Case study

## 1 Introduction

Companies tend to control organisational deviation strictly because they would get serious damage when it has been revealed. Direct control of deviation may, however, reduce the power of Innovation, because both deviation and innovation have similar mechanisms of breaking standards.

### 1.1 Similarity of innovation and deviation

In sociology, deviation is classified into three categories<sup>[1]</sup>. First is criminality, second is violating conduct norms, and third is labeling. This paper is based on the concept of the second category, because it contains similar notions to innovation which is achieved from organisational improvement by breaking standards. Our model is built from the belief that organisational deviation and innovation have similar mechanisms, but they are only different in the external utility or disutility.

Organisational deviation does not always occur according to immoral agents' wrongdoing<sup>[2]</sup>. It may emerge from unintentional behaviors of the agents with the bounded rationality, because they tend to act shortsightedly and to converge to local optima<sup>[3]</sup>. It means that if agents have behaved in order to conduct Innovation, they would commit deviation unintentionally by producing disutility to the society. The shortsighted behavior is enhanced by the difficulty with recognizing the utility landscape. Therefore, we incorporate a hierarchical utility landscape into our model by expanding the landscape theory<sup>[3][4]</sup> in order to increase complexity.

### 1.2 Cases of Japanese companies: Toyota and a Pastry company

To convince the idea of the unified framework, we will show cases of Japanese companies. First case is about Toyota, which conducted huge amount of recalls with brake system failure. It is said that increasingly sophisticated brake systems sometimes have problems with unpredictable handling by users. In other words, excessive Innovation may be a cause of this trouble.

In another case, a Japanese pastry company, Akafuku Corp. was accused on suspicion of falsifying the expiration dates of its products. By the analysis, it was revealed that the excessive effort to avoid disposing products was one of the causes of this case. The pastry company possibly did not falsify the expiration dates intentionally. They attempted Innovation activities excessively in order to extend product expiration, and that led them to the violation of law as a result. This case explains that the border between Innovation and deviation is subtle in some cases, and both phenomena can emerge by slight changes in circumstances.

### 1.3 Purpose of this paper

The inextricably linked phenomena such as innovation and deviation are difficult to acquire comprehensive understanding by single method, because they are complicated and ambiguous. Therefore, this paper proposes the approach to inextricably linked phenomena with unified model and multiple methods such as computer simulation, manual simulation, and fictional case description based on the model as shown in figure 1. It enables to get comprehensive and deep understanding of inextricably linked phenomena with distinguishing the common elements and different elements of innovation and deviation

The rest of the paper is organized as follows: Section 2 explains our unified model of Innovation and

deviation; Section 3 shows the simulation experiment settings and results; Section 4 presents case design and analysis approach, and from section 5 to section 9, the details and sample outputs of this approach are explained; Section 10 presents our findings and remarks as a conclusion.

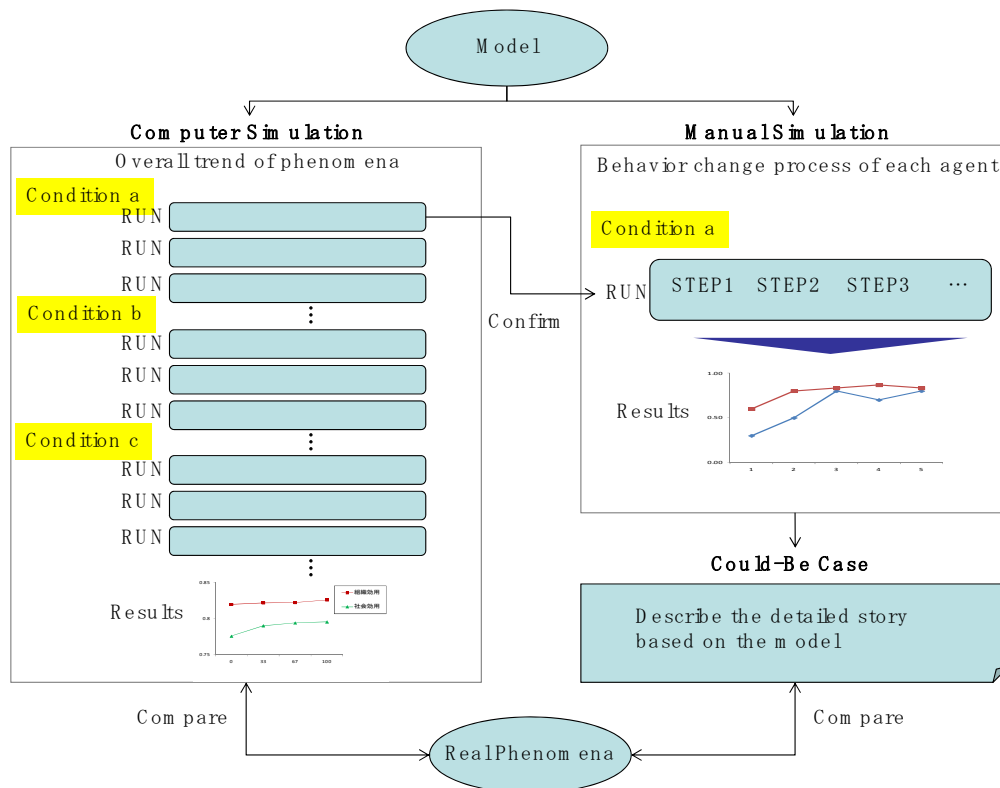


Figure 1 Proposed Approach by Simulation and Case Design Method

## 2 A Unified Model of Innovation and Deviation

### 2.1 Structure of the model

This section describes our unified model of deviation and Innovation, which simplifies a real structure of an organization and the relation between an organization and a society. In this model, hierarchical utility landscape is implemented that consists of three classes: individual, organisational and social utility.

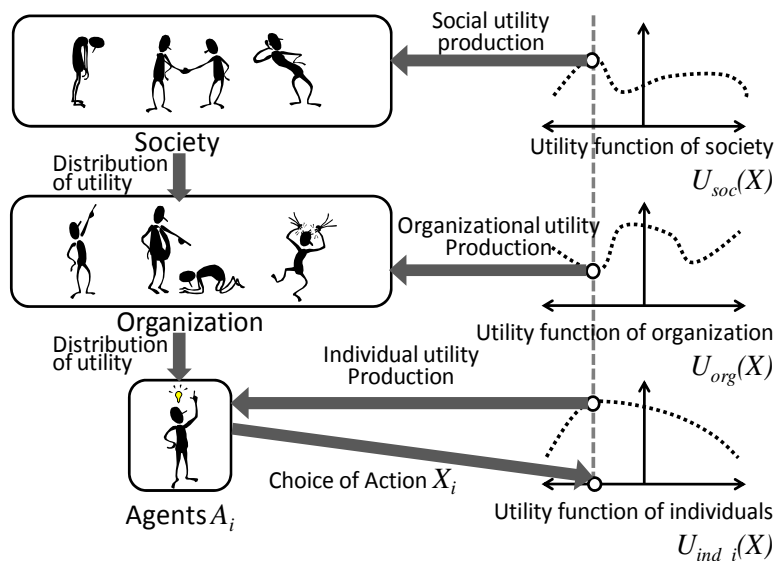


Figure 2 Structure of the Agent Based Model

Figure 2 shows outline of hierarchical utility landscape in our model. Utility function of individuals means experience and values of each agent. Utility function of organization means strategy and business model of a company. Utility function of society means social norms.

In this model, agents choose their actions according to the rewards from organization and information from neighbors. As a result, their utility production amount for an organization and a society is determined based on utility landscape. Agents can recognize their own utilities, however, they cannot recognize organisational and social utility landscape completely. Therefore, both deviation and Innovation may emerge depending on experiment conditions in this model.

For example, in the previous pastry company case, employees could recognize their individual utility: the reduction of product disposals is consistent with their beliefs. On the other hand, they could neither recognize the social regulations, nor company’s damages due to consideration of violating law. In other words, they could neither recognize social utility nor organisational utility landscape thoroughly. As a result, they conducted organisational deviation despite of aiming at Innovation.

Based on the above understanding, we define two types of phenomena as shown in table 1 according to our model: a) Innovation is the increase of both organisational and social utility production, b) Organisational deviation is the decrease social utility production.

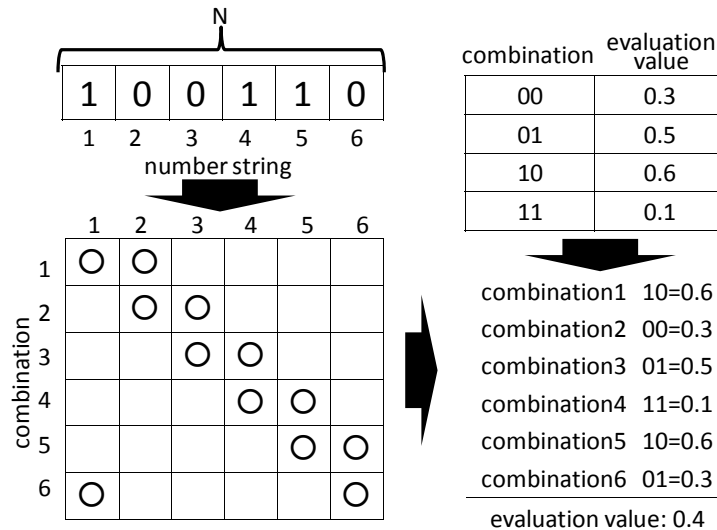
**Table 1 The Definition of Innovation and Deviation**

Definition	Organizational utility production	Social utility production
a) Innovation	increase	increase
b) Deviation	increase/decrease	decrease

**2.2 Utility function**

The Utility functions which are described in the previous section, are based on the NK fitness landscape model by Kauffman [5] [6]. NK model determines the values of N integer sequences, and utility landscape is defined by the combinations of K integers.

Figure 3 describes a sample of integer combinations and their values, in case of N=6 and K=1. The variation of utility functions is described by number sequences and their evaluation values. Evaluation value is given between 0 to 1 depending on combinations of integers. The complexity of utility landscape depends on the number of integers and their combinations.



**Figure 3 NK Fitness Landscape Model**

**2.3 Choosing actions of agents**

Each agent changes their action in order to increase their satisfaction according to the following formula. The degree of satisfaction of agents increases along with the rising of their individual utilities:  $U_{ind\_i}(X)$ , rewards from organization:  $Re$ , and contributions for social utility:  $U_{soc}(X)$ .

$$S(U_{ind\_i}(X), Re_i) = U_{ind\_i}(X) + Re_i + U_{soc}(X) \tag{1}$$

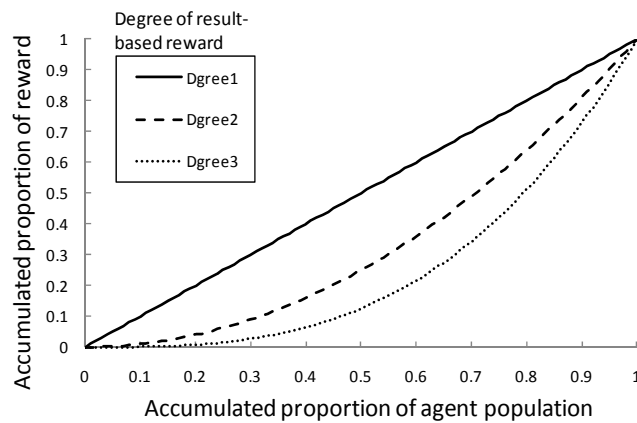
Agents imitate the actions of other agents whose actions are similar to them and receiving more rewards from organization, according to the following formula.  $L_{ij}$  means the similarity of action between agents. Agents evaluate their satisfaction after imitation, and then return to original action when their degrees of satisfaction have been declined by the imitation.

$$P_j = \frac{Re_j \times L_{ij}}{\sum_{k \neq i} Re_k \times L_{ik}} \tag{2}$$

The agents produce their own utility, and contribute to organisational and social utility as the result of their actions. The contributions of agents are accumulated in an organization and a society.

**2.4 The variation of reward distribution**

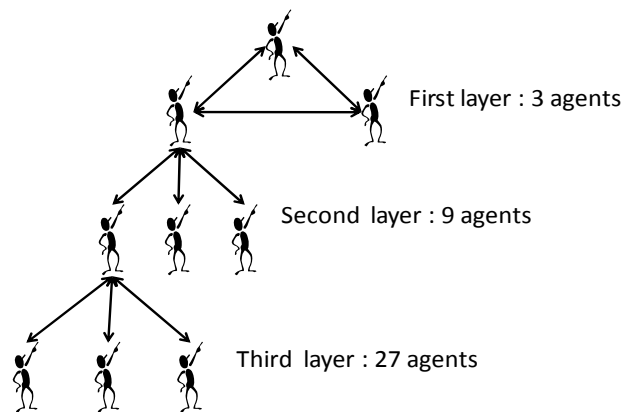
The accumulated external utility is distributed to agents based on their amount of contribution through the system of rewards. The degree of result-based reward is strengthened progressively as shown in figure 3.



**Figure 4 Variation of Reward Distribution**

**2.5 Organisational structure**

Hierarchical organisational structure which consists of three layers is brought into our model, because hierarchical structure is seen in many companies. Figure 5 shows the structure of organization and the number of agents in each layer. There are 39 agents in total.



**Figure 5 Organisational structure**

**2.6 Elements of the model**

Table 2 lists the elements of our model which are described in previous sections. The elements are defined based on description standard of agent based modeling [7] [8] and categorized in four groups; Landscape, Characteristics of Organizations, Behavior of Organization Members, Result of Behavior.

**Table 2 Elements of the Model**

Category	Elements of Agent Based Model
Landscape	Hierarchical Landscape: Social Utility, Organizational Utility, Individual Utility
	NK Model: Conflict between Social Utility and Organizational Utility
Characteristics of Organizations	Utility Distribution
	Diversity of Individual Utility
	Network Structure
Behavior of Organization Members	Network Setting Up Rule
	Behavior Status Change of Agents
	Structure of Agent's Satisfaction
	Hill Climb and Imitation Learning Algorithm
	Incomplete Information Environment
Result of Behavior	Variation in Social Utility, Organization Utility, Individual Utility Production

### 3 Simulation Experiment

Based on the descriptions of the model in previous section, we have developed the simulator according to agent based computational architecture [9] in Java language. This section describes settings and results of the agent based simulation experiment. Those results are confirmed by manual simulation and case description in following section.

#### 3.1 Experiment settings

In this experiment, we set the two types of parameters. Those are 1) diversity of agents, and 2) conflict of utility function as shown in table 3. We set each experimental condition, and investigate the changes in utility production amount of an organization and a society by altering the combinations of those parameters. In the next subsections, simulation experiments are organized according to those parameters.

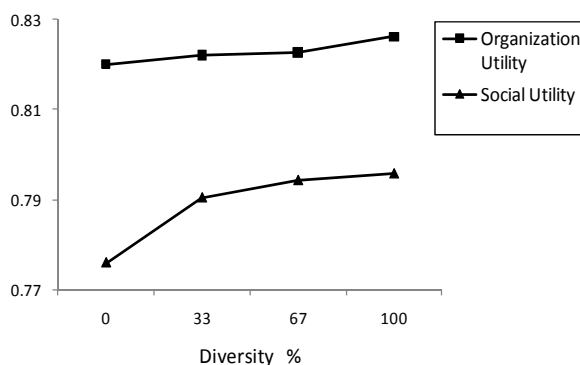
**Table 2 Experiment condition**

Parameters	Conditions		
1 Diversity of agents	0% uniform	↔	100% diversified
2 Conflict between social utility function and organizational utility function	0 synchronized	↔	1 contrary

#### 3.2 Experimental results of diversity of agent's characteristics

Figure 6 shows the result that is emerged when improving diversification in agents. We control the diversity by increasing and decreasing the number of agents who have same individual utility function. All agents have unique utility functions in the organization with 100% diversity, while they have common utility functions in the organization with 0% diversity. The other conditions are fixed; conflict degree between utility functions is 0.4 and result-based reward is second degree.

In figure 6, both social utility and organisational utility productions are increasing with improving diversification. This result suggests that the diversification in agents prompts Innovation type activities according to the definitions in Table1, and the result is corresponding to previous study [10].



**Figure 6 Utility production change that occurs with diversification**

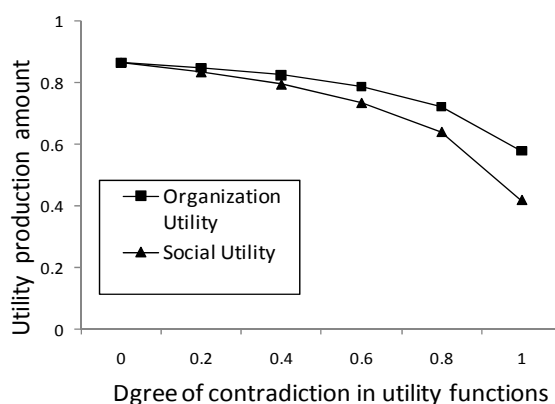
This result means that mutual imitation in diversified organization makes individual utility production decline, because individual utility functions of agents are different from each other. As a result, agents tend to increase organisational utility and social utility production amount in order to complement the lowering of individual utility production, and to maintain their satisfaction which is determined by the formula (1).

**3.3 Experimental results by the conflicts between utility functions**

Figure 7 represents the result of changing conflict degree between social utility and organisational utility functions. The other conditions are fixed; diversity of agents is 100% and result-based reward is second degree.

In figure 7, both social utility and organisational utility production are declining with strengthening of contradiction in social and organisational utility function.

This result means that conflict in the utility landscape prompts organisational deviation and also causes stagnation phenomenon according to the definition in Table2.



**Figure 7 Utility Production Change Occurs with Strengthening of Contradiction in Utility Functions**

**4 Case Design and Analysis Approach**

Figure 8 presents the steps of case design and analysis. The simulation results in previous section are confirmed through these steps moreover innovation and deviation phenomena are analyzed from different point of view. The overview of case design and analysis approach is as follows.

The first section is Case Settings. In this section, the model elements are converted to the elements of business management. Then case story template and utility landscape are developed according to those elements. The second section is Could-Be Case Development. In this section, manual simulation is conducted based on utility landscape. And could-be cases are developed in line with the case story template. The third section is Confirmation of Simulation Results. The results of agent based simulation are confirmed by the manual simulation in this section. The fourth section is Case Analysis. The could-be cases based on the agent based model are compared to relative real cases, and differences in description are analyzed.



The details and sample outputs of each section are explained in following chapters.

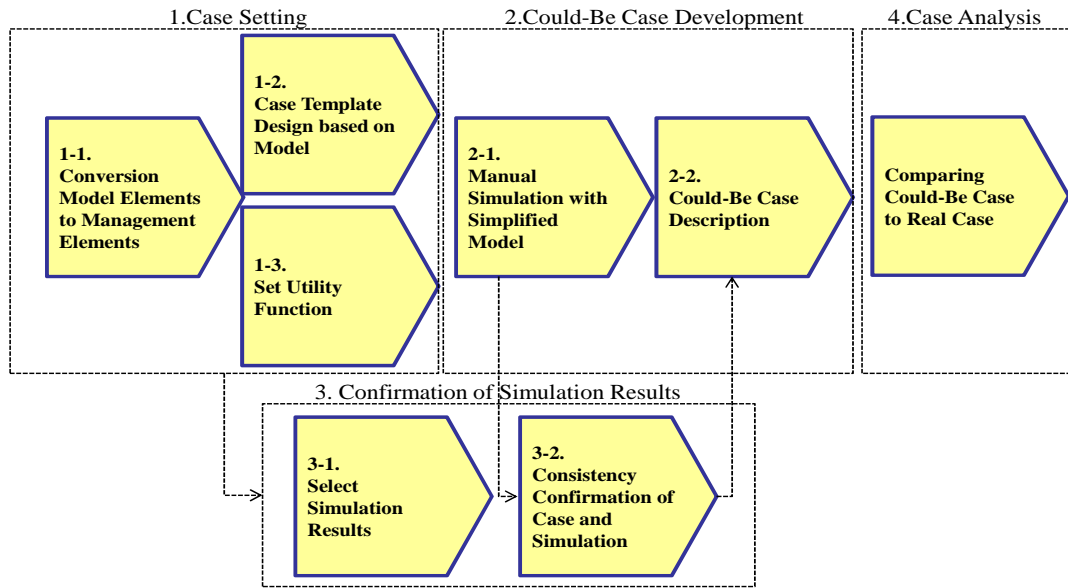


Figure 8 Case Design and Analysis Approach

## 5 Case Settings

### 5.1 Conversion model elements to management elements

The elements of the model which are shown in table 1 are converted to the elements of business management in order to develop the template for case description. Table 3 shows the result of conversion.

Table 3 Comparison of Model Elements and Business Management Elements

Category	Elements of Agent Based Model	Elements of Business Management
Landscape	Hierarchical Landscape: Social Utility, Organizational Utility, Individual Utility	Social Norms, Business Model, Individual Value
	NK Model: Conflict between Social Utility and Organizational Utility	Conflict between Social Norms and Business Model
Characteristics of Organization	Utility Distribution	Personnel System
	Diversity of Individual Utility	Diversity of Organization
	Network Structure	Communication Environment in Organization
Behavior of Organization Members	Network Setting Up Rule	Encounter among Employees
	Behavior Status Change of Agents	Behavior Change of Employees
	Structure of Agent's Satisfaction	Source of Employee's Motivation
	Hill Climb and Imitation Algorithm	Learning Mechanism of Employees
	Incomplete Information Environment	Cognitive Limit
Result of Behavior	Variation in Social Utility, Organization Utility, Individual Utility Production	Variation in Legal Compliance, Corporate Earnings, Employee's Motivation

### 5.2 Case template design based on model

The elements of business management listed in table 3 are organized and mutually interrelated in figure 9 as a template for case description. The common template shown in figure 9 is customized according to specific situations, and case stories are developed based on the template.

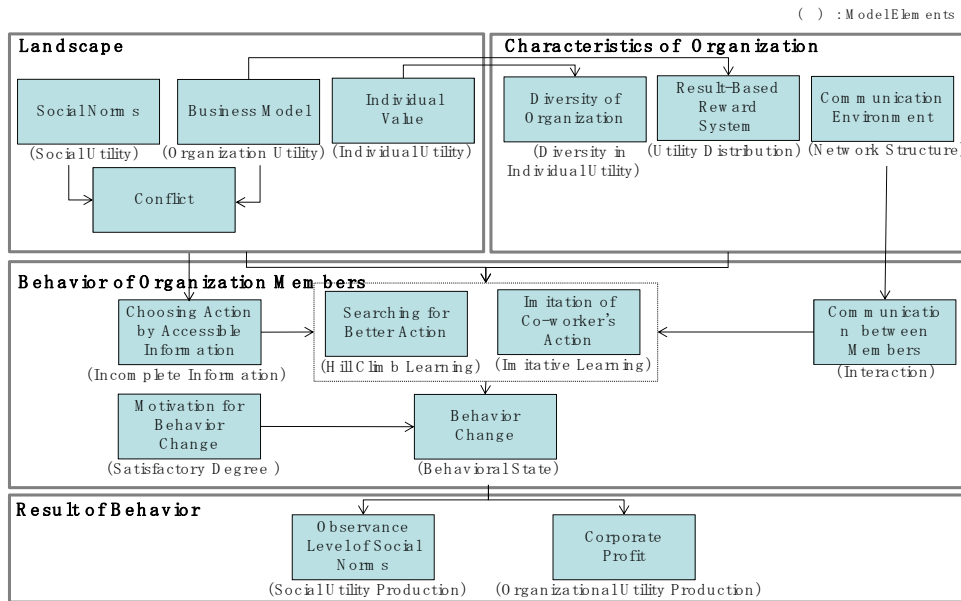


Figure 9 Case Story Template

5.3 Set utility function

A specific case situation is set in table 4 and table 5 using NK model which is described in 2.2. We have set N=3 and K=1 for case settings and manual simulation.

A fictional food maker is assumed in this paper. We assume that this food maker is required to reduce the production cost because of increasing competition however there are strict regulations in food industry.

Table 4 Case Situation Settings on NK Model

Options	Alternatives of manufacturing control (N=3)		
	1. Cost Reduction	2. Use-By Date Setting	3. Quality Control
0	Production Process Efficiency	Based on Guidelines	Bacteria Test by Devices
1	Waste Prevention of Raw Materials	Based on Judgments in Manufacturing Premise	Flavor Test by Human Work

Table 5 Dependence Relationship between Alternatives

Combination of Alternatives	00	01	10	11
Safety of Products	High	Medium	Medium	Low
Cost Reduction Effect	Low	Medium	Medium	High

6 Manual Simulations with Simplified Model

Before case development, utility landscapes are set based on NK model, and manual simulation based on simple NK model is conducted. Table 6, 8, and 9 show the utility landscapes which mean social norms, the food maker's policy of manufacturing control, and each assembly leader's policy. The situation of case A is that all assembly leaders have same management policy, so that means uniform organization. The case B is that each assembly leader has different management policy, so that means diversified organization. In the case C, diversified organization is set as same as case B, however the conflict between social norms and food maker's policy is more significant.

The landscape settings, the process, and results of manual simulations of those three cases are

describes in following subsections. The manual simulation enables the confirmation of computer simulation results by tracing the behavior changing of each agent particularly.

**6.1 Manual simulation: case A**

In case A, there is a certain degree of conflict between social norms and food maker's policy, and all assembly leaders have same cost-conscious management policy as shown in table 6. Table 7 describes the process of manual simulation of case A, which is conducted according to landscape settings and model rules. Each assembly line leader conducts behavior change by searching for more satisfactory action, and also imitating of another leader's action according to NK model settings as shown in table 7.

Figure 10 shows the transition of utility production by assembly leaders as the results of behavior change. The social utility production means contribution to society by protecting of food safety. The organization utility means contribution to corporate objectives such as cost reduction. Assembly leaders receive rewards by their contributions. The individual utility means comfort of leaders which are achieved by the consistency with their management policies. As shown in figure 10, deviation type phenomenon emerges because social utility production amount is decreasing while organization utility production is increasing. It is because that all assembly leaders have cost-conscious management policy, and the food maker has also cost-conscious management policy while balancing with food safety.

**Table 6 Utility Landscape Setting: Case A**

Combination (K=1)	Evaluation Value				
	Society	Company	Assembly Line Leaders		
	Safety-Conscious	Safety and Cost Balance	Leader1 Cost-Conscious	Leader2 Cost-Conscious	Leader3 Cost-Conscious
00	0.4	0.1	0.1	0.1	0.1
01	0.3	0.3	0.2	0.2	0.2
10	0.2	0.4	0.3	0.3	0.3
11	0.1	0.2	0.4	0.4	0.4
000	0.40	0.10	0.10	0.10	0.10
001	0.30	0.27	0.20	0.20	0.20
010	0.30	0.27	0.20	0.20	0.20
100	0.30	0.27	0.20	0.20	0.20
011	0.20	0.30	0.30	0.30	0.30
110	0.20	0.30	0.30	0.30	0.30
101	0.20	0.30	0.30	0.30	0.30
111	0.10	0.20	0.40	0.40	0.40

**Table 7 Process of Manual Simulation: Case A**

Step		1	2	3	4	5
Description of Steps		Each leader takes different action.	Leader1 imitate the action of leader 2 for more reward.	Leader 1 imitate the action of leader 2 for more reward.	Leader 1 and 2 keep current action because they cannot find more satisfactory action.	All leaders keep their actions because they cannot find more satisfactory action.
		Leader 1 takes the safest action and receives the least reward .	Leader 2 and 3 search more satisfactory action.	Leader 2 keeps current action. Leader 3 imitate the action of leader 2.	Leader 3 turn back his action because of satisfaction decreasing.	
Assembly Leader	Behavior Change	Initial Status	Imitate	Imitation	Stay	Stay
	Combination of actions	<b>000</b>	<b>001</b>	<b>011</b>	<b>011</b>	<b>011</b>
	Social Utility Production	0.40	0.30	0.20	0.20	0.20
	Organization Utility Production	0.10	0.27	0.30	0.30	0.30
	Individual Utility Production	0.10	0.20	0.30	0.30	0.30
	Reward	0.16	0.22	0.30	0.30	0.30
Satisfaction	0.66	0.72	0.80	0.80	0.80	
Assembly Leader	Behavior Change	Initial Status	Search	Stay	Stay	Stay
	Combination of actions	<b>001</b>	<b>011</b>	<b>011</b>	<b>011</b>	<b>011</b>
	Social Utility Production	0.30	0.20	0.20	0.20	0.20
	Organization Utility Production	0.27	0.30	0.30	0.30	0.30
	Individual Utility Production	0.20	0.30	0.30	0.30	0.30
	Reward	0.24	0.33	0.30	0.30	0.30
Satisfaction	0.74	0.83	0.80	0.80	0.80	
Assembly Leader	Behavior Change	Initial Status	Search	Imitate	Turn Back	Stay
	Combination of actions	<b>100</b>	<b>110</b>	<b>011</b>	<b>110</b>	<b>110</b>
	Social Utility Production	0.30	0.20	0.20	0.20	0.20
	Organization Utility Production	0.27	0.30	0.30	0.30	0.30
	Individual Utility Production	0.20	0.30	0.30	0.30	0.30
	Reward	0.24	0.33	0.30	0.30	0.30
Satisfaction	0.74	0.83	0.80	0.80	0.80	

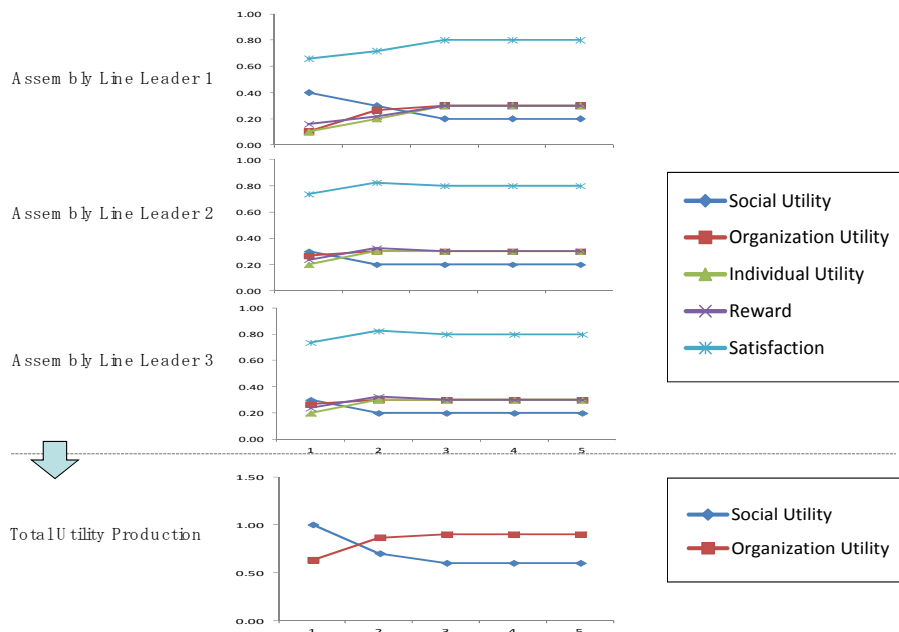


Figure 10 Manual Simulation Result: Case A

6.2 Manual simulation: case B

In case B, there is a certain degree of conflict between social norms and food maker's policy, and each assembly leader has different management policy as shown in table 8. The management policy of leader 1 is safety conscious, leader 2 is balance of safety and cost, leader 3 is cost conscious.

Figure 11 shows the transition of utility production by assembly leaders as the results of behavior change. As shown in figure 11, innovation type phenomenon emerges because social utility production and organization utility production amount are increasing. It is because that leader 1 and 2 have found the appropriate action which enable the increasing of both social utility and organization utility by own searching. And in addition, leader 3 who has cost conscious policy, has imitated their actions although he could not find the appropriate action by himself.

The explanation of manual simulation process of case B is omitted.

Table 8 Utility Landscape Setting: Case B

Combination (K=1)	Evaluation Value				
	Society	Company	Assembly Line Leaders		
	Safety-Conscious	Safety and Cost Balance	Leader1 Safety-Conscious	Leader2 Balance	Leader3 Cost-Conscious
00	0.4	0.1	0.4	0.1	0.1
01	0.3	0.4	0.1	0.4	0.1
10	0.2	0.3	0.1	0.4	0.1
11	0.1	0.2	0.1	0.1	0.4
000	0.40	0.10	0.40	0.10	0.10
001	0.30	0.27	0.20	0.30	0.10
010	0.30	0.27	0.20	0.30	0.10
100	0.30	0.27	0.20	0.30	0.10
011	0.20	0.30	0.10	0.30	0.20
110	0.20	0.30	0.10	0.30	0.20
101	0.20	0.30	0.10	0.30	0.20
111	0.10	0.20	0.10	0.10	0.40

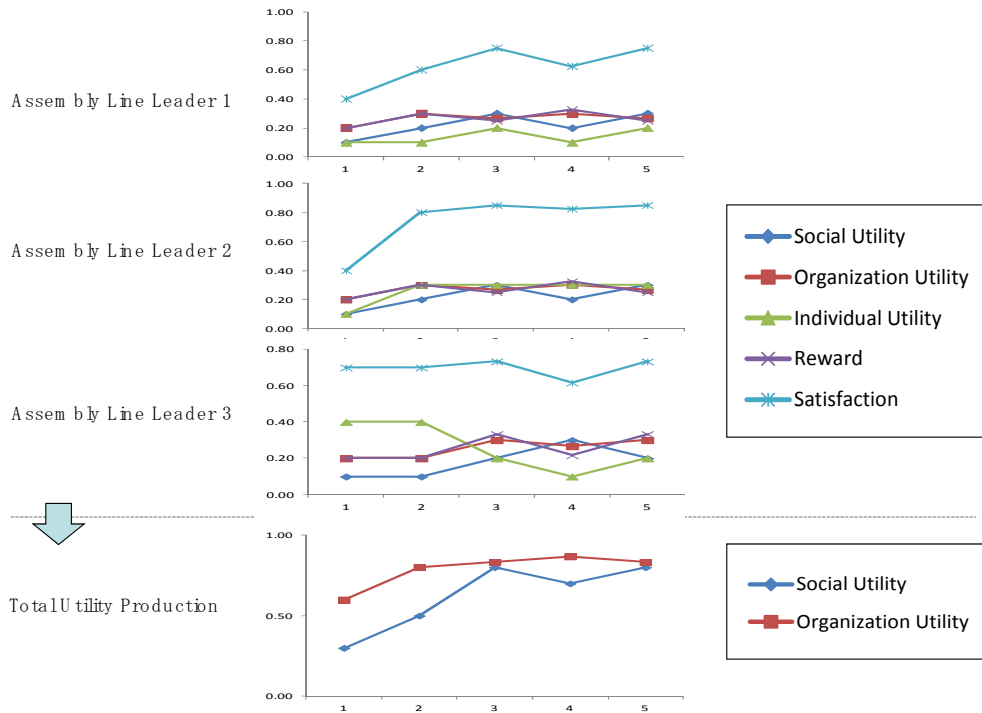


Figure 11 Manual Simulation Result: Case B

6.3 Manual simulation: case C

In case C, each assembly leader has different management policy as same as case B, however there is significant degree of conflict between social norms and food maker's policy as shown in table 9.

Figure 12 shows the transition of utility production by assembly leaders as the results of behavior change. As shown in figure 12, social utility production is kept low level compared to organization utility. As a result, innovation type phenomenon does not emerge in case C even though the organization is diversified as same as case B. It is because that the food maker applies the highly cost conscious policy, so that assembly leaders do not select the action of increasing product safety which leads them to reward decreasing because of result-base reward system. The significant conflict between social norms and corporate policy inhibits the searching ability of diversified organization.

The explanation of manual simulation process of case C is omitted.

Table 9 Utility Landscape Setting: Case C

Combination (K=1)	Evaluation Value				
	Society	Company	Assembly Line Leaders		
	Safety-Conscious	Cost-Conscious	Leader1	Leader2	Leader3
			Safety-Conscious	Balance	Cost-Conscious
00	0.4	0.1	0.4	0.1	0.1
01	0.3	0.2	0.1	0.4	0.1
10	0.2	0.3	0.1	0.4	0.1
11	0.1	0.4	0.1	0.1	0.4
000	0.40	0.10	0.40	0.10	0.10
001	0.30	0.20	0.20	0.30	0.10
010	0.30	0.20	0.20	0.30	0.10
100	0.30	0.20	0.20	0.30	0.10
011	0.20	0.30	0.10	0.30	0.20
110	0.20	0.30	0.10	0.30	0.20
101	0.20	0.30	0.10	0.30	0.20
111	0.10	0.40	0.10	0.10	0.40

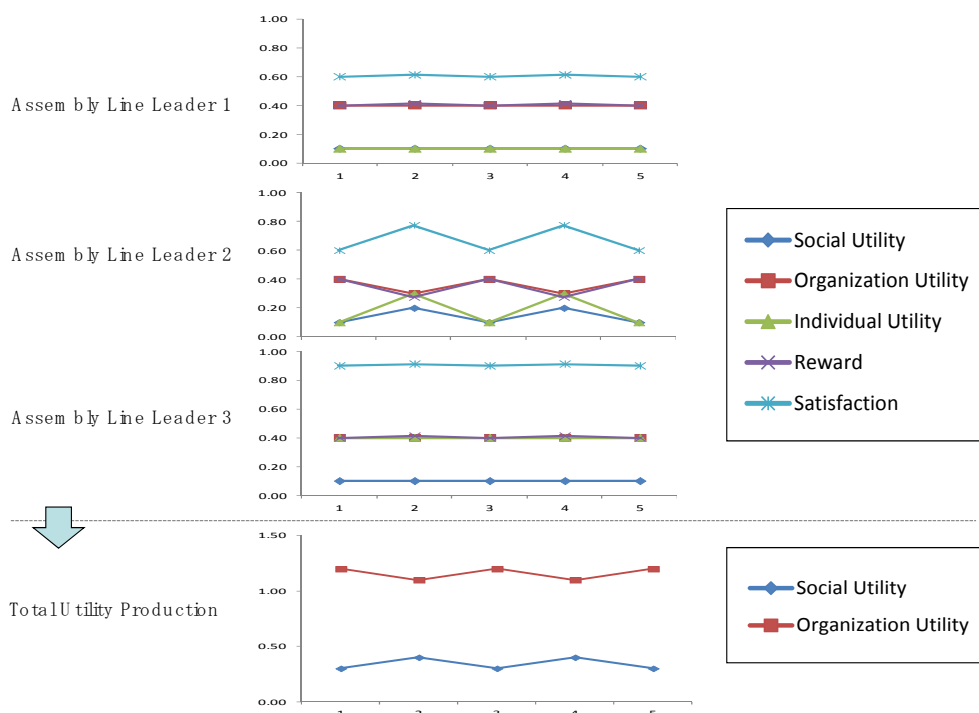


Figure 12 Manual Simulation Result: Case C

## 7 Confirmation of Simulation Results

In section 3.2, the computer simulation result is shown in figure 6 which is suggesting that the diversification in agents prompts Innovation phenomena. This result is confirmed by manual simulation in section 6.1 and 6.2 by observing the behavior change of each agent. The results of manual simulation show that diversified organization tends to emerge innovation type phenomena in case B while uniform organization tend to emerge deviation type phenomena in case A.

In section 3.3, the computer simulation result is shown in figure 7 which means that conflict in the utility landscape prompts organisational deviation even though diversity of agents is 100%. This result is confirmed by manual simulation in section 6.2 and 6.3. The results of manual simulation show that agents do not select the action of increasing product safety, for avoiding reward decreasing in case C.

## 8 Could-Be Case Description

A fictional case is described in this chapter based on the case story template (figure 9) and the results of manual simulation. There are two purposes of model based case description. The first is to understand the emergence process of innovation and deviation at more detailed level than simulation. The second is to compare the description level of model based case with that of actual case which describes real innovation and deviation phenomena.

The underlined portions are model elements and the italic words in parenthesis are the name of model elements. Only the story of case A is described in this paper. The stories of case A and B are omitted due to space limitation.

### 8.1 Story of case A: uniform organization

A food maker applied the product cost reduction policy because of severe competition in food industry. The company intended to balance cost reduction and product safety (*Organization Utility Function*), however its policy was not completely fit to the requirements from consumers (*Conflict between Social Utility and Organisational Utility*).

In the food maker, the education programs were conducted for employees in order to strengthen their sense of cost reduction. As a result, most employees shared strong cost-consciousness (*Individual Utility Function*) in that company. Under the situation, cost reduction activities were executed in one of the factory in the food maker as follows.

There were three assembly line leaders in the factory whose cost reduction policies were different from each other at the beginning. The assembly line leader 1 applied the safest way in three leaders. He

sought production process efficiency, set use-by date based on guidelines, and conducted bacteria test for quality control (*Behavior Status*). The leader 2 applied same method of cost reduction and use-by date setting as leader 1, however he conducted flavor test instead of bacteria test (*Behavior Status*). The leader 3 pursued waste prevention of raw materials, but ensured product safety by set use-by date based on guidelines, and conducted bacteria test (*Behavior Status*).

In that situation, the assembly line leader 1 who applied the safest policy received the least reward according to the result-based reward system (*Utility Distribution*). The leader 1 was frustrated at less reward and changed his way of quality control from bacteria test to flavor test by imitating the way of leader 2 (*Imitation Learning*). At the same time, the leader 2 and 3 applied the method of setting use-by date based on case-by-case judgments for more cost reduction achievement through their trial and errors (*Hill Climb Learning*). This method had a risk of product safety decreasing, however it was consistent with their cost-conscious policy (*Individual Utility Function*). Therefore the leader 1 received less reward again because the leader 2 and 3 applied more effective cost reduction method (*Individual Utility Function*), even though he imitated the method of leader 2 previously. So that, the leader 1 imitated the method of leader 2 again (*Imitation Learning*), because leader 2 received more reward than him.

As described above, all three leaders applied more effective cost reduction method while sacrificing the safety of products. They recognized the methods which are effective for product safety, but they were not satisfied with those methods because of inconsistency with their cost-consciousness and less reward (*Structure of Agent's Satisfaction*). As a result of assembly line leader's behavior change, the factory achieved cost reduction target (*Organization Utility Production*), however its risk of reducing the product safety increased significantly (*Social Utility Production*).

### 9 Case Analysis

Three case stories are compared with each other and common elements and different elements by cases are distinguished in figure 13. According to the computer simulation, it is detected that diversity of organization and conflict between social norms and corporate policy may be the branch condition of innovation and deviation. Moreover, not only the branch conditions of innovation and deviation but also their impacts on the behavior of agents are detected by the manual simulation and case description.

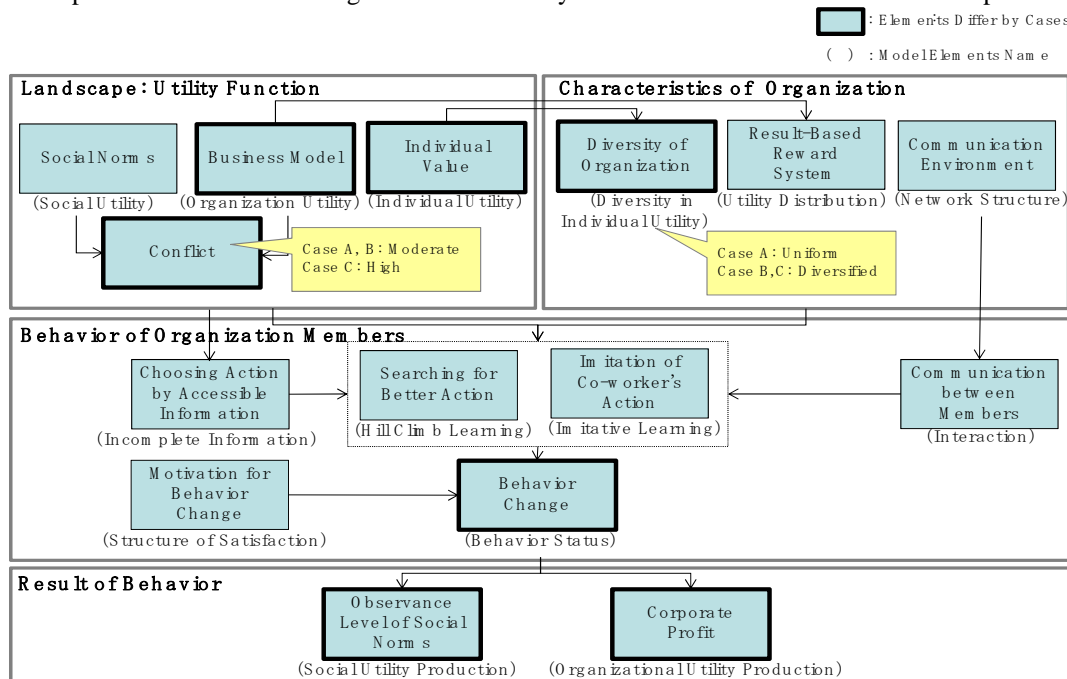


Figure 13 Common Elements and Different Elements by Cases

### 10 Conclusion

This paper presented a methodology for analyzing inextricably linked phenomena such as organisational innovation and deviation by combination of agent based simulation, manual simulation and case description.

As described in the beginning of this paper, both Toyota and the pastry company intended to conduct innovation in order to increase their organisational utilities, however they fell into deviation by unintentional decreasing of social utility. For example, Toyota conducted huge amount of recalls with brake system failure and the pastry company falsified the expiration dates of products. According to the results of simulation and case description, it is detected that the emergence of deviation or innovation depends on those conditions; diversity of organization, and conflict between social and organisational landscape. It is also detected that innovation phenomena emerges in the diversified organization on consistent utility landscape, and that how these conditions impact on behavior and learning activity of agents.

The advantage of this method is that it enables to approach toward inextricably linked phenomena with unified model and the combination of multiple methodology for analysis .

In the further work, we would refine the method of manual simulation and model based case description with applying this method to another type of inextricably linked phenomena.

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## Logistics Management Innovation of Tobacco Industry Based on Green Supply Chain Management

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**Abstract:** With the strategy of sustainable development, environmental impact and the optimization of resources utilization has been considered in supply chain management, the concepts of green supply chain management begin to arise, therefore, reforms and innovations become necessary for logistics management which is an important link of supply chain, this is the same truth for tobacco industry in which logistics is one of the core business. This paper makes clear the concepts and intension of green supply chain management, summarize the present research status of logistics management innovation of China and international tobacco industry, under the circumstances of green supply chain, using the exploratory research method, analyzes the problems existed in tobacco industry logistics management, with the intent of sustainable development, puts forward the logistics management innovation of tobacco industry through thought, methods and system innovations which on the basis of green supply chain management, to achieve the win-win situation of both economic and social benefits of every member in tobacco industry supply chain.

**Keywords:** Green Supply chain management; Exploratory research method; Tobacco; Logistics management; Innovation

### 1 Introduction

With the opinion of sustainable development strengthened in the field of logistics management and supply chain, green supply chain management arose at the moment. It is the Manufacture Research Committee (MRC) of Michigan State University who first proposed the concepts of green supply chain, they put forward this brand-new concept in 1996 when they were doing the research of “Environment Responsible Manufacture” (ERM), they thought that green supply chain is a kind of crossing and integration between environmental awareness, the effective utilization of resources and energy with every link of the supply chain, its aims are the highest resources utilization, the smallest impact for environment and the optimization of system benefits. The scholars in China also gave their own definitions for green supply chain: green supply chain management is a new kind of management thought, method and technology formed on the basis of traditional supply chain management which further emphasizes the basic thought of green manufacture, it requires that every link in supply chain including all supplier, manufacturer, wholesaler, retailer, consumer and recycle merchant should emphasize environment protection and resource utilization, to promote harmonious development of economy with environment and finally achieve the win-win situation of economic and social benefits.<sup>[1]</sup> According to the above definitions, the intension of green supply chain management includes two aspects: one is that green supply chain management which aims to sustainable development is strategy management; the other is that the effective practice of green supply chain management is a system engineering, the cooperation of every link member in supply chain is necessary, the final purpose is not only the win-win situation of each link member, but also for the entire supply chain.

In China, tobacco industry is one of the main industry and is a controversial industry, too. As one of the core business of tobacco industry, logistics is bound to be the core competitiveness of tobacco industry in future, therefore, the research on logistics management innovation of tobacco industry will become the hotspot of research in logistics field.

In 1998, The Center for Advanced Purchasing Studies of America published “Environmental Green Supply Chain Management”, mainly introduced some analysis tools and cases. In 2008, the special issue “Greening Supply Chain Management” is published by the international journal Greener Management International. In recent years, most related references abroad are qualitative analysis on the basis of investigation research and international comparison, most research focus on green purchasing, environmental assessment system and transverse logistics, there is few system theories and methods research of logistics management innovation from the point of view of green supply chain management, there is even fewer research paper on logistics management innovation of tobacco industry from the point of view of green supply chain management.

In China, the research on logistics management and green supply chain management has just

started, some scholars in academic field has done a series of research. In 2004, in the book of “Green Supply Chain Management”, Zhu Qinghua comprehensively introduced and analyzed the generation, content, analyzing tools, related technology and strategy of green supply chain management from theory and application, some cases are introduced and analyzed, too. In 2009, in the book of “The Innovation of Enterprise Logistics Management”, Gu Hanwen made some probes on how enterprises to achieve the integration and centralization of logistics management innovation, and deeply discussed the logistics innovation of enterprise logistics cost management, service management, logistics outsourcing and logistics alliances, etc. Most research papers on logistics management innovation of tobacco industry are seen in some periodicals, such as “Logistics Operation Status and Direction of Tobacco Commercial Enterprise” of Dong Xiangjun in “Logistics Engineering and Management”, “Exploration of Tobacco Logistics Management Based on Green Logistics” of Zhao Jingyuan in “Logistics Technology”, etc, but, the starting point of these papers is how to increase enterprise economic benefit, there are few papers discussing logistics management innovation from the point of view of green supply chain management and with the purpose of sustainable development.

This paper takes the sustainable development as guidance, views ecological economy and economic development as a cause-and-effect organic whole, puts supply chain as the background of tobacco industry logistics management, makes green supply chain management as the basis of tobacco industry logistics management innovation, discusses the methods of logistics management innovation to achieve the win-win situation of both economic benefits and social benefits in tobacco industry.

## 2 The Problems Existed

As the largest tobacco production and consumption country in the world, there are 30% of global cigarette consumers in China, tobacco industry takes crucial position in China national economy. With China being a member of WTO, tariff of tobacco products is reduced, quota and license control is loosened and even canceled, abroad tobacco products pour in, there will be bitter competition and challenges in China tobacco market from abroad tobacco magnate, logistics which is called “The third profit source” will become important method for enterprises facing competition. However, the research of logistics management in China has just started and the research on logistics management of tobacco industry is only in the past few years, there are many problems existed in the thought, theoretical research and practical works of logistics management.

First, the thought of logistics management falls behind. For a long period, the understanding of tobacco industry to logistics commonly limited on the value-added practice such as transportation and storage, lacking of understanding and research on high value-added practice such as design of logistics system, logistics service and logistics information system which considering logistics of the tobacco industry under the background of supply chain, not even to mention the research on the environmental and resources cost of logistics activities from the point of view of sustainable development, lacking of the thought that modern logistics is “the third profit source”, not able to consider logistics management as the key to promote manufacture process and strengthen market management, but to put logistics activities on subordinate position. All these backward thought definitely lead to the situation that logistics system and logistics management fall behind.

Second, the methods of logistics management fall behind. In developed countries, from 1970s, the computer technology, information technology, bar code and satellite position system and so on has gradually become the effective auxiliary methods in tobacco enterprise logistics management, the advanced technology such as MRP, MRPII, ERP and JIT and advanced management methods such as activity-based costing, supply chain management have been introduced, applied and spread in logistics management. In China, although computer management has been basically achieved in tobacco industry enterprise, the development and application of professional logistics information system still fall far behind. For time being, tobacco industry lacks the unified logistics management information platform on the two levels of municipal and provincial, there are many types of logistics software, the system integration is not high, the integrated information network of production, commerce and retail has not been fully linked up; logistics center location, the route optimization of transportation and optimization of storage are still in the stage of half-human decision; the technology content of logistics practice is not high, inefficient human work is in the majority, forklift truck, guided crane, automated guided vehicle and automatic sorting machine are not widely used in logistics practice; logistics cost information system is not formed, the operation of logistics management is rather empirical. All these factors seriously restrain the effectiveness of logistics management.

The third, the standardization of logistics management falls behind. After China being a member of WTO, logistics globalization is the inevitable tendency, the key is the logistics standardization for China tobacco industry logistics system to integrated with the standards of international logistics system. For recent years, a considerable progress has been achieved in China tobacco industry logistics standardization process, there are a dozen of logistics or related standards released, but there is still huge distance from the real standardization, mainly including: The first, there is little consciousness of logistics standardization, socialized division of specialty is not scientific, the degree of standardization is low, the broken rate is high, the speed of logistics is greatly reduced, the cost of logistics increases; the second, there are many logistics standards but few precise, the revision of logistics standards can not keep the pace with the requirement of industry development, every region, every industry and even every enterprise works on their own, diversified differences and flaws of logistics standards restrain the coordinate operation of logistics, the complete and fluent supply chain can hardly be formed for goods flow through every link of manufacture, circulating and consuming, there exist huge waste of human resources, time and space resources, the cost of logistics keeps high, as the logistics cost data from 2009 to 2011 of a provincial tobacco company shown in table 1, we can see the tobacco industry logistics cost increases with yearly; the third, the percentage of international standards adopted is low, for national standard, industry standard or enterprise standard, the percentage of standards which can be the same with international standards is low, that is even fewer for considering international environmental standard in logistics standards or directly applying the international environmental standard in logistics management, all these factors certainly will be the barriers for modernization and globalization of logistics management.

**Table 1 The Logistics Cost From 2009 To 2011 Of A Provincial Tobacco Company**

Category \ Year	2009	2010	2011
logistics cost	262 million yuan	2627million yuan	302 million yuan

### 3 Basic Contents and Specific Measures

Tobacco industry logistics management runs through the whole process of cigarette production and sale of tobacco industrial and commercial enterprise, according to industry standard, there are three kinds of tobacco logistics: tobacco raw materials logistics, tobacco production enterprise logistics and tobacco transportation and distribution logistics. For logistics of different stages in supply chain, although the operation procedures are different, the thought, methods and system of logistics management can be referred to each other and even be shared. Therefore, this paper aims at the above problems existed in tobacco industry logistics management of China, under the circumstances of green supply chain, take the sustainable development as purpose, proposes logistics management innovation of tobacco industry in the aspects of thought, methods and system.

#### 3.1 Thought innovation

Thought revolution is the premise of material revolution and social revolution. Thought innovation is a field of innovation that can not be disregarded, it is of great importance to the economy development and promoting social progress. Logistics management thought innovation of tobacco industry based on green supply chain includes two aspects: one is to establish the thought of tobacco industry logistics strategy management based on supply chain, the other is to establish the thought of tobacco industry green logistics based on green supply chain.

##### 3.1.1 Establish the thought of logistics strategy management

The so-called logistics strategy management is a kind of comprehensive management for enterprise logistics activities, includes a series of management decisions and actions of enterprise to draw up, carry out, control and evaluate logistics strategy, its core question is making enterprise logistics activities compatible with environment, to achieve the long-term and sustainable development of logistics.<sup>[2]</sup>Based on this notion, to establish the thought of tobacco industry logistics strategy management based on supply chain requires taking the view of supply chain, carrying out the comprehensive management for tobacco industry enterprise logistics activities which includes activities between industrial enterprises, between industrial with commercial enterprises and between commercial enterprises, its core question is making enterprise logistics activities compatible with environment and the development of supply chain, to achieve the long-term and sustainable development of logistics. Under the guidance of this thought, tobacco industry enterprises should emphasize the reforms on these two aspects:

The first, enterprises should think logistics management as the strategy management. Under the

circumstances of supply chain, the effective proceed of logistics activities is helpful not only for the efficiency of enterprise daily operation, but also for promoting the competitiveness of enterprise, the more important is that it can speed up all kinds of flows (capital flow, information flow, material flow) in supply chain, promote the operation efficiency of the whole supply chain. Therefore, enterprises have to think logistics strategy as an important part of total strategy, even the same with operation strategy.

The second, enterprises should carry out coordinate logistics strategy in supply chain. Coordinate logistics means that breaking results limit of each enterprise, through coordination and union, creating the most suitable logistics operation structure. The tobacco industry coordinate logistics strategy is based on two reasons: the personalization and diversification of cigarette consuming demand cause the distribution of various of kinds, small volume and frequently; on the other hand, some small and medium-sized enterprises do not have the capacity of just-in-time distribution and associated logistics system, they can not meet the distribution requirement of frequently and small volume. For the time being, coordinate logistics strategy is classified as transverse coordinate logistics strategy, longitudinal coordinate logistics strategy and the third party coordinate logistics strategy, for tobacco industry, between industrial enterprises or between commercial enterprises, they can select transverse coordinate logistics strategy according their own condition, between industrial enterprise and commercial enterprise, they can select longitudinal coordinate logistics strategy, for some smaller size municipal enterprise, the clients dispersed and sale volume is small, if they operate logistics independently, the cost generated will largely offset enterprise profit, they may consider the third party coordinate logistics strategy with the third party such as postal logistics.

### 3.1.2 Establish the thought of green logistics

The concepts of green logistics arose in the 1990. For the time being, there is not an internationally accepted definition for green logistics, different scholars all have their own opinions. Wu and Dunn think green logistics is a kind of environment-oriented responsible logistic system, including green forward logistics from purchase of raw materials, production, packaging, transport and storage to delivery to users as well as green management of waste recycling and reverse logistics.<sup>[3]</sup> Jorn and Palle think green logistics is Eco-Management for forward logistics and reverse logistics.<sup>[4]</sup> The logistics management innovation based on green supply chain management inevitably requires the sustainable development as the final purpose, to establish the thought of green logistics is also the inevitable choice of this requirement. Green logistics of tobacco industry includes two aspects:

The first is to control the pollution of logistics system, it means that adopting the scheme which has the lowest environmental pollution in the planning and decisions for physical system and logistics activities. To control logistics pollution requires enterprises think from the point of view of supply chain, through every stage of supply chain, keep the though in mind of environmental protection and resources effective utilization. In raw material stage, tobacco industrial enterprise should be strict with the selection of raw material such as cut tobacco, cigarette paper and filter rods, as far as possible select harmless environmental protection material for production, select recyclable or pollution-free disposable material for cigarette packing products and strictly eliminate the phenomenon of cigarette excessive packaging; in tobacco production logistics stage, as far as possible select the production mode with noise-free and smallest resources waste; in cigarette circulation and distribution logistics stage, select the truck model of smallest discharge, distribute in short distance and at night time for avoiding traffic jam and to save fuel and decrease emissions; in recycle and waste material logistics stage, deal with responsibility for cigarette packing materials such as paper box and plastics, making money and also care about the aftermath.

The second is to establish scientific disposing procedure for cigarette waste and confiscation of fake cigarette. In the production and operation process of tobacco industrial enterprise, there is a lot of cigarette waste such as waste cut tobacco, cigarette paper, filter rods and packing materials, and there is a huge amount of fake and low-quality cigarette confiscated in the anti-counterfeiting activities of commercial enterprise. For a medium size prefecture-level city, there are about 400—600 pieces, or 20000—30000 items, of fake and low-quality cigarette confiscated yearly, the traditional disposing method is burning to destroy for these waste and fake cigarette, the burning process mostly locate at garbage field out of city, about ten ships of huge container are needed for transporting these waste to garbage field, a large amount of fire-assistant such as diesel need be transported, too. It is clear that, the logistics process of these waste is time-consuming and expensive, there is a great potential safety hazard, too, more than this, there are a huge amount of dense smoke and nitrogen oxide generated in the disposing process which makes great pollution. For the purpose of sustainable development, the logistics department of tobacco industrial and commercial enterprise have to establish the specific and

pollution-free logistics and disposing process, to avoid environmental pollution resulted from mismanagement.

### **3.2 Methods innovation**

Although the logistics management methods of enterprises in different supply chains are not the same, the field of management informationization and socialization requires all enterprise to set foot in, tobacco industry is no exception, this paper probes into the methods innovation of tobacco industry logistics management from the point of view of the informationization and socialization of logistics management.

#### **3.2.1 Informationization of logistics management**

Logistics activities must be accompanied with a lot of information flow activities, in-time, accurate and plenty of information greatly increase the effectiveness of logistics activities. The sustainable development of tobacco enterprise and supply chain depend on advanced information system, the same as well, the sustainable development of logistics management can not be without advanced information system. Informationization of tobacco industry logistics management includes two aspects:

The first is to set up logistics information platform based on supply chain. The enterprises in supply chain need to break the situation that they work on their own, through information technology, enterprises should integrate logistics resources, to achieve information sharing, keep the information channels open of supply chain, make information acquirement and update in-time and effective. The establishment of logistics information sharing platform in tobacco industry should be based on the common information platform from all parts of the country and National Bureau. China Tobacco E-commerce Company or Tobacco Standardization Committee should take the lead to use XML and Web Service technology to determine resources sharing integration construction standard, and then use the standard to integrate the information platforms under the jurisdiction of all provincial units, so as to form industrial resource information sharing platform. Through the information platform, the production and sales enterprises can achieve dynamic real-time query and visual functions; they can master merchandise sales trend in real time; they can master the varieties, amount, quality and store time of warehousing in real time; they can query the dynamic situation of transporting capacity resources in specific line, and select suitable transport enterprise and carrier; they can select the redundant store capacity of union enterprise, and automatically connect to the warehousing management system of warehouseman, so as to achieve dynamic management on merchandise inventory.

The second is using advanced technology to optimize the information platform. For the time being, a lot information technology has been used in logistics management, there are electronic data interchange system (EDI), barcode technology, point of sale information system (POS), electronic order system (EOS), wireless radio frequency technology (RF), satellite position system (GPS), geography information system (GIS) and data storage technology, etc. For time being, the technology of wireless radio frequency electrical ID(RFID), EOS and data storage have been widely used in some large-scale tobacco industrial and commercial enterprises, but, there are very few tobacco enterprises using the technology of GPS and GIS which are most important for the completion of tobacco industry logistics system.

#### **3.2.2 Socialization of logistics management**

The socialization of logistics management referred in this paper means logistics outsourcing. Logistics outsourcing can be part of enterprise logistics function, also can be the whole logistics function, it can be one-time trade relationship and also can be long-term partnership. For the time being, the models related with logistics outsourcing are the third party logistics and the fourth party logistics.

If logistics capacity can not be the enterprise core competitiveness, or logistics management is not in the high level, outsourcing logistics function to the third party logistics enterprise would decreased enterprise operation cost or improved customer service quality. Stated as above, some smaller-scale tobacco commercial enterprise may decrease their operation cost through selecting the third party logistics.

The idea of the fourth party logistics management is born out of the third party logistics, generally, the fourth party logistics is: focused on the contract, establish a new kind of relationship between enterprises(consignor or consignee) with some third party logistics supplier and technology service supplier, and give comprehensive management and guidance for the logistics activities of the series of supplier and clients(consignor or consignee) in supply chain with a few third party agents in the network of "vertical integrated" or "horizontal integrated". As the integrator of supply chain, the fourth party logistics is not a simple integration of the third party logistics, but melting organically the functions of consultation, finance and information technology into the third party logistics, so it has stronger logistics

management capacity than the third party logistics, capable to afford specific technology service such as technology, supply chain techniques, marketing and project management. For example, American Ryder Integrated Logistics became strategic allies with information technology magnate IBM and Accenture Consulting, it makes Ryder Logistics having special capacity in technology and supply chain management. China tobacco industry may learn from the experience of Ryder, introducing the fourth party logistics, become strategic allies with domestic and abroad famous logistics consulting company, acquiring the management ability of logistics and supply chain, to promote their own comprehensive competitiveness.

### **3.3 System innovation**

The logistics management system provides standards for all kinds of enterprise logistics activities, to make innovation for enterprise logistics management activities, the innovation of correspondent logistics management system is becoming inevitable. This paper puts forward logistics management innovation of tobacco industry based on green supply chain from two aspects which are internationalization and standardization of logistics management system.

#### **3.3.1 Internationalization of logistics management system**

The internationalization of logistics management system requires that, while drawing up logistics management system, the tobacco enterprises in supply chain consider not only their own condition, also requiring themselves initiatively with international standards. Logistics management innovation of tobacco industry based on green supply chain has very strict requirement for environmental protection and resources utilization in tobacco logistics process, however, there is relative minor or even no punishment for enterprise environmental pollution in China tobacco industry, this makes tobacco industry enterprise not to consider controlling pollution for saving operation cost. Because this kind of cost externalization is legal and better for promoting enterprise profits, the personal goals of supply chain members conflict with target of the whole green supply chain when they are seeking for maximum enterprise profits. The more important thing is that, the “green” target of green supply chain covers the whole life cycle of products, this target can not be achieved when the logistics activities in any stage of supply chain can not be compatible with environment. Therefore, to achieve the logistics management system innovation of tobacco industry requires inevitably that, the state and tobacco industry establish tobacco industry logistics management system, with the purpose of sustainable development, to achieve environmental protection and resources effective utilization.

#### **3.3.2 Standardization of logistics management system**

As stated above, the degree of standardization for China tobacco industry logistics management is very low, and there are a lot of differences existed between standards of different enterprises and national standards with the international standards. The standardization of logistics management system of tobacco industry based on green supply chain requires that, the logistics management standardization should be unified for the same kind of enterprises in the same supply chain, on the basis of international standardization, national logistics standards should be established according to industry actual situation, the logistics standards enacted by enterprises themselves should be the same with or higher than national standards, and keep integrated with international standards. It is particularly emphasized that, the logistics management standards of tobacco industry based on green supply chain should not only meet the requirement of industry standards, but also for the requirement of international environment management standards such as ISO 14000 series. Tobacco industry should take the lead to develop green logistics, strive for passing the verification of these international environmental management standards, to become the vanguard for internationalization and greening of China logistics management.

## **4 Conclusions**

Under the circumstances of economy globalization, “survival of the fittest” is the survival code not only in biological world, it is also suitable in the business world, to be follower of times, even the maker of standards, you have to be the best. In order to get the position in the bitter international competing for market, China tobacco industry logistics must catch the times, intending for the sustainable development, undertake a series of necessary reforms. Logistics management innovation of tobacco industry based on green supply chain is the necessary requirement of sustainable development, is the effective way to achieve the win-win situation of both economic and social benefits for all members in tobacco industry supply chain, is the inevitable choice of globalization of China tobacco logistics, is the important content of later research, too. Only while seizing the opportunities and bold of innovation, the “green” spring of

China logistics management of tobacco industry would come soon.

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# A Study on Customer Acquisition Cost and Customer Retention Cost: Review and Outlook

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**Abstract:** It's a general tendency for enterprises to take customers as the center, focus on their value and improve their interests. Customer Cost is the foundation of customers' interests. This paper reviews many domestic and foreign scholars' viewpoints on Customer Acquisition Cost (CAC), Customer Retention Cost (CRC), the ratio of Customer Acquisition Cost to Customer Retention Cost, elaborates the key points and difficulties of Customer Cost Analysis and reveals the difficulties in the Customer Relationship Management(CRM).

**Key words:** Customer Acquisition Cost (CAC); Customer Retention Cost(CRC); Customer Relationship Management(CRM); Customer lifetime value

## 1 Introduction

Customers are entitled to have more rights in the new economic era. They gradually become the center or initiators in the exchange between sellers and buyer. Accordingly, customer orientation plays a leading role in marketing activities. It is essential for enterprises to analyze Customer Cost in order to improve customers' value and gain more profits from them. Customer Cost Analysis is the premise of the implementation of Customer Relationship Management (CRM) and personalized marketing. This paper reviews many domestic and foreign scholars' viewpoints on Customer Acquisition Cost (CAC), Customer Retention Cost (CRC), the ratio of Customer Acquisition Cost to Customer Retention Cost, elaborates the key points and difficulties of Customer Cost Analysis and reveals the difficulties in the Customer Relationship Management(CRM)and clarifies the direction for future studies.

## 2 Customer Acquisition Cost

What cost do the enterprises need to pay to acquire the new customers? Is CAC the same for the enterprises in different industries? What is the relationship between CAC and business performances of enterprises? Scholars' researches focused on the following points:

### 2.1 The nature of customer acquisition

Kaplan and Norton(2004)pointed out that the customer relationship management (CRM) consists of four procedures, namely selecting customers, acquiring customers, retaining customers and developing relationships with customers, the implementation of which is indispensable in CRM; acquiring new customers is the most difficult and expensive procedure in CRM.

### 2.2 The component of Customer Acquisition Cost (CAC)

Kaplan and Norton(2004)made a brief study of the Component of CAC. They put forward and analyzed the target and index of measure of customer acquisition. Reichheld Frederick (1990, 2002), analyzed different forms of CAC and held that CAC includes the expenses on new customers, such as the advertising expense, the commission of promotion, and the expenses on managing salespersons. In different industries, CAC takes different forms. For instance, in credit card companies, CAC comprise direct-mail advertising cost, credit assessment cost, credit card issuing cost, and the cost on opening new accounts in the data processing system of banks which is about \$ 50-100 for each new customer. In a advertising consulting industry, CAC also involves the time and money spend by senior managers on making sales proposal and treating potential customers. In retail industry, CAC includes the discount for and the cost on setting branch stores.

F.J. Mulhern (1999) analyzed two approaches of distributing customer acquisition cost: (1) in certain industries, there are some clear and specific acquisition cost, such as the investigation of sales calls, product specifications, and discounts. (2) More typically, acquisition cost cannot be directly distributed to individual customers. For instance, manufacturers of packaged products spend large sums of money on media advertising and most of them want to attract new customers. However, there is no way to match the forms of media with these attracted customers. Therefore, the only possible approach of distribution is to calculate the average cost of all customers.

### 2.3 Customer Acquisition Cost (CAC) in different industries



Chen and Hitt(2002), F.F.Reichheld and P. Schefter(2002)held that Customer Acquisition Cost has a clear nature of variation. It has been calculated that “ranging from \$ 40 per customer of the Amazon site to more than \$ 400 of some online brokers (McVey, 2000). This may be the greatest contribution to new B to C in its start-up phase costs, on behalf of most of the initial economic losses generated by these companies. “They analyzed the typical acquisition cost of each customer in different industries: \$ 56 in consumer electronics / application industry, \$ 84 in grocery industry, and \$ 53 in garment industry.

#### **2.4 The relationship between Customer Acquisition Cost (CAC) and business performance**

What is the relationship between Customer Acquisition Cost (CAC) and Business Performance? Ang and Buttle (2006) analyzed Customer Relationship Management Performance of business direct mail in UK (See Table 1). They believed that in direct mail industry, each CAC is the ratio of the total amount of mailing cost to the number of new customers in 1998. From Table 1 we can see that the acquisition cost for each account of direct mail based on CRM is 1/3 higher than that of the traditional direct mail, while the average sales volume and profits it generate in 3 years are more than three times higher. Therefore, we can come to the conclusion that what really matters is customer’s contribution to enterprises’ initial sales and every acquired customer’s rather than extremely lower CAC.

### **3 Customer Retention Cost**

What cost do enterprises need to pay to retain old customers? What impact will it have on corporate value? Does Customer Retention Cost vary in different industries? Scholars' researches focused on the following points:

#### **3.1 The nature of customer retention**

Kaplan and Norton (2004) held that it costs lesser to retain regular customers than to acquire new customers who replace the former ones. Owing to their recognition of the product quality and service of certain brand, the loyal customers do not care its higher price. They seldom give up their preference to the chosen brand; therefore competitors need to give a big discount to draw their attention successfully.

**Table 1 Customer Relationship Management Performance of Business Direct Mail in UK**

	Dict Mail Based on CRM	Traditional Direct Mail
The number of mailing catalogue	1000	500
Mailing cost	3000 £	1500 £
The number of newly acquired customers in 1998	65	45
Changing rate(new customers)	6.5%	0.09%
The initial sales volume of each Acquired customer	180 £	120 £
Sales revenue from the total initial products	11700 £	5400 £
The acquisition cost of each account	46.15 £	33.33 £
The average sales volume of customers in1998-2001	7500 £	2200 £
Three years’ gross margin(40%)	3000 £	880 £

Source: Ang & Buttle (2006)

#### **3.2 The component of customer retention cost**

Kaplan and Norton(2004)made a brief study of the Component of Customer Retention Cost. They put forward and analyzed the target and index of measure of customer acquisition. Bauer (2003) and others analyzed the component of CRC. They put forward that Customer Retention Cost involves the cost on promotion and recruitment, on mailing catalogue or sending personalized greeting cards related to such catalogue, Restore Cost is included. There are two different types of Restore Cost: one refers to the cost occurring before the termination of the relationship in order to avoid betraying, and the other occurs after the relationship ends, spent on marketing in order to retain customers.

#### **3.3 The influence of the customer retention cost on the corporate value**

What influence will Customer Retention Cost have on corporate value? Bain & Company(1990) conducted a research in credit card industry and put forward that the profits made by a customer for the company vary as time goes by:-\$ 51 in the starting year; \$ 30 in the first year; \$ 42 the second year for; \$ 44 the third year; \$ 49 the fourth year for; \$ 55 the fifth year. This confirms that the longer the customer and company maintain relationship, the more profits it will bring to the company.

Winner (2001) demonstrated the significant of the retaining customers (compared with attracting and changing customers) on Companies’ present value by means of the cases in e-commerce (See Table

2).

From Table 2 we can see that if the three indexes related to customer retention (the amount of taxes on repeated customers, changes in repeated customers, the rate of customer loss) increase by 10% in value, then the influence of the added value 5.8%、9.5%、6.7% on e-commerce companies is higher than that of attracting and changing customers(0.7% and 3.1%,0.8%, 2.3% and 4.6%).

**Table 2 The Impact on E-commerce Companies' Present Worth with the Index Increase by10%**

	Index	Definition	Value	10% Increase	Added Value
Attracting Customers	Visitor Acquisition cost	marketing and promoting cost/visitors	\$5.68	\$5.11	0.7%
	Changes in new visitors	added numbers of new visitors1Q→2Q	62.4%	72.4%	3.1%
Change Customers	Acquisition cost for new customers	marketing and promoting cost/customers	\$250	\$225	0.8%
	Change rate of new customers	the rate of new visitor's becoming customers	4.7%	14.7%	2.3%
	Changes in taxes on new customers	added new taxes1Q→2Q	88.5%	98.5%	4.6%
Retain Customers	The amount of taxes on repeated customers	the added taxes from repeated customers 1Q→2Q	21.0%	31.0%	5.8%
	Changes in repeated customers	the rate of customers becoming repeated customers	30.2%	40.2%	9.5%
	The rate of customers loss	the first half rate of repeated customers in 1999	55.3%	65.3%	6.7%

source: Mckinsey &Co.1999

### 3.4 Customer retention cost in different industries

Is CRC in different industries the same? The study of Bain &Company (1990) shows that Customer Retention (Here stands for "Betrayal Rate") has a close relation with Customer Lifetime Value (See in Table 3). From Table 6 we can see that the longer the relationship between customers and enterprises is the lower the betrayal rate is; therefor the expected time of such relationship is longer, and Customer Lifetime Value is higher, which proves the importance of Customer Retention.

Table 3 Customer Lifetime Value (LTV)

A	B	C	D=B*C
Betrayal Rate(The rate for annual customer loss)	The expected time for relationship between customers and enterprises(year)	Annual value (value)	Lifetime (value)
20%	5	3000	15000
10%	10	3000	30000
5%	20	3000	60000
2.5%	40	3000	120000

Source: Bain &Company, 1999

## 4 The Ratio of Customer Acquisition Cost to Customer Retention Cost

In Customer Relationship Management, should enterprises focus on acquiring new customers or retaining old ones? This, to a certain extent, depends on the ratio of CAC to CRC. Studies on this aspect can be seen. The following summary is based on a general description and a comprehensive description.

### 4.1 General description

Chowhan and Saxena(2011)held that Customer Retention Cost only accounts for a small part of Customers Acquisition Cost. Zhao Qiankun and He Cencheng(2009)put forth that the cost of acquiring a new customer is two to six times higher than retaining an old customer. Peppers and Rogers(1993)thought that the cost of attracting a new customer is 4 to 6 times higher than retaining an old customer. Gronroos(1984), Rust and Zahorik(1993), Raphael and Raphael(1995), FanYunfeng(2003)believed that the cost of acquiring a new customer is four times higher than retaining an old customer. In the article "Management God", it is put forward that according to a survey, the average cost of acquiring a new customer is \$118.16 while that of making an old customer satisfied is \$19.76. Therefore, acquiring a new customer will spend more than five times of money than keeping an old customer (5.98 times). This amount of money could be used to improve the working environment,

improve your salary, or make you continue working for your company. Rosenberg and Czepiel(1983), Sasser(1990)claimed that the cost for developing a new customer is about 6 times than retaining an old customer. Coffey and Palm(2005)put forward that the cost of acquiring a new customer's cost is 5-7 times as much as you are cross selling your products to an old customer. Ahmed and Buttle(2001) presented that the researchers found that the ratio of CRC to CAC is between 1/5 and 1/10. Li Yingchun(2005)proposed that generally speaking, the cost of acquiring a new customer is about 5 to 6 times higher than retaining an old customer.

In a word, the scholars whose opinions are shown in various literature have both consensus and difference in the ratio of CAC to Customer Retention Cost. Their consensus is that the CAC is higher than the CRC, and the difference lies in the specific ratio ( which varies from 2 to 10 times).

#### **4.2 Comprehensive Description**

The Chartered Institute of Marketing specially published an article (2010) to summarize the researches on the ratio of CAC to CRC in the academic circle. It pointed out that the following material lists different numbers between CAC and CRC, of which the "cost" ranges from 3 times to 30 times.

"It is universally acknowledged that the cost of acquiring a new customer ranges from 4 to 6 times." (The article contains a calculation formula for LTV.) "Usually, it costs less to sell to an old customer and the cost of acquiring a new customer is 5 to 8 times higher than retaining an old one." "65% of a company's business comes from its old customers. And the cost of attracting a new customer is 4 times than that of making an old customer satisfied." (The data comes from Gartner). "We know that the cost of acquiring a new customer is higher (about 7 times) than marketing to an old one. This means that you should make more marketing efforts to deal with the people you know but not the strangers." It is generally acceptable that the cost of finding a new customer is two times higher than selling to an old customer. The common business wisdom tells us that the cost of acquiring a new customer is 9 times higher than retaining an old customer. "The usual average number is: selling to a new customer costs six times higher than selling to an old customer." "The cost of attracting a new customer may be 15 times higher than retaining an old customer." Statistics show that the cost of attracting a new customer is 5 to 10 times than retaining an old customer. Besides that, the cost of acquiring a new customer is over 67%. "Customer Lifetime Value includes any product that customers buy from you in the past, at present and the future. And the cost of acquiring a new customer is 20 times than making an old customer satisfied according to the calculation." The study shows that the cost of acquiring a new customer is 30 times higher than retaining an old customer, which means that you should keep a very close relationship with your customers. Therefore, you should know their exact requirements and aim at being their supplier at present and in the future and you should be irreplaceable. "The cost of acquiring a new customer is 5 to 10 times higher than retaining an old customer." "Most business activities place their marketing efforts on acquiring new customers. However, the cost of selling to a new customer is 7 to 20 times higher than to an old customer." The above mentioned online materials are dated before March, 2010.

Since the numbers above come from different scholars' research in different period with different objects of study (regions and industries), they are not comparable. This kind of phenomenon shows that it is complex to calculate customer cost and the difficult to make the comparison between different costs.

### **5 Conclusion**

In conclusion, the present problems and the focus of the future research are as follows:

Scholars have reached an agreement on the definition of customer cost, holding that it is a combination of all kinds of resources spent in the whole process when enterprises keep its relationship with its customers, which embodies the systematicness and integrity of the customer cost.

Scholars' studies of CAC focused on the nature of the acquired customers, the component of the CAC, the differences of CAC in different industries, the relationship between CAC and Business Performance and so on. The consensus is that CAC is the most expensive part of CRM. The forms of CAC in different industries vary. There exists problems in the study of the relationship between CAC and Business Performance and the present studies don't admit that the lower CAC is , the higher sales volume and profits the enterprise gains.

Scholars' study of CRC focus on the nature of the retained customers, the component of the Customer Retention Cost, the differences of CRC in different industries, the value of customers retention to the enterprises and so on. The consensus is that the CRC is much cheaper than the

Customer Acquisition. The forms of Customer Retention Cost in different industries vary. The influence of retaining customers on corporate value is more obvious than attracting and changing customers. However, the conclusion needs to be proved in different regions and industries.

Opinions vary greatly about the study of the ratio of CAC and CRC, with figures ranging from 2 times to 30 times. Meanwhile, a consensus has been made that CAC should be higher than CRC.

In the new customer-oriented economic era, the key of marketing and management of enterprises has transferred from products to customer, and customer profitability has replaced the market share to become the priority for enterprises when making decisions. Under this situation, carrying out the study of calculating and comparing of CAC and CRC is of great urgency and important theoretical value.

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# Exploration and Research of Design Strategy Based on User Experience

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**Abstract:** The purpose of this thesis is providing the advanced strategic thinking and method about adjustment for domestic enterprises in the stage of the transformation of economic development within industry area in China. The method used in the study is known as Qualitative Analysis and Case Study, emphasize the unified designed strategy in the Apple company, which is to find potential needs of customers and design good user experience, set a solid foundation for its leading position in the field of IT, through the analysis of six layers : Brand Strategy, Research and Development of Products, design strategy, production and marketing, product strategy, management and leadership in Apple Company. It has important guiding role for domestic enterprises to develop design strategy based on user experience to effectively improve product development and innovation capabilities. In addition, design strategy formulation of company should combine with national conditions. So the spread of design strategy based on user experience in China cannot go without government, enterprise, market. In the future, the range of user experience will be more widely in product and service design which based on internet of things, and the innovation based on user experience will be the soul of the development of internet of things. Therefore, the studies showed that the design strategy based on user experience can provide strong intellectual support for product planning and sustainable development of enterprises.

**Key words:** Design strategy; User experience; Apple company; Qualitative analysis method; Case study method

## 1 Introduction

With the rapid development of information technology, people's demand for products has far exceeded the single "form" and "function" on the satisfaction in modern society. Products with good user experience tend to be the winner in the market competition. User experience is the overall feeling and impression when one is using a kind of product and service. This experience is accumulated in the course of formation, including psychological experience and physical feelings. <sup>[1]</sup>It emphasizes User Centered Design, treating user as the focus of the design and development activities. <sup>[2]</sup>Those that have a good user experience of products and service gain more and more popularity, and design concept, which is users experience-oriented, has become the most effective way for brand competition. First draw the attention of user experience internationally for Design corporation is IDEO that making the products become more friendly through observation users habits when they using the products. And some of the domestic internet company have been setting up Design Center of user experience to carry out research so as to promote the products development because of industrial demand characteristics and needs around in 2005.

In recent years the world is embracing design strategy, while ensuring the realization of business mission, this strategy is to figure out the relationship between design strategies and marketing environment, to make design direction and competition method, also embodied design principles of corporate culture at the same time. Design and select development and action plan to realize the target, based on company's overall strategic objectives, <sup>[3]</sup>Design is emphasized as a gene, existing in all levels of the enterprise, and plays an active role.

The principle of user experience and design strategic concept emerged in post-industrial era, when great changes were taken place in consumer awareness, where product diversity and emotional appeals weigh more. As experience economy era is coming, the concept of the design shifts from material form centered to person centered. Therefore, the target of products and services is to provide consumers with a comprehensive experience-based system. Here Apple Company sets an excellent example.

## 2 Design Strategies and Methods Based on User Experience:Apple Company

Apple is endowed with insights for customer demand, especially for finding potential customers needs. In Apple's history, strategies at different levels for innovations were witness as follow:

## **2.1 Brand strategy**

In the late 1990s, when Steve Jobs returned to Apple Company, he re-evaluated and retained the 10 products with high potential to optimize the company's product line, and highlighted the company's brand strategy "Think Different". Under this guidance, Apple introduced two revolutionary products: a transparent jelly-like texture of the iMac and the music industry Queen, the iPod.

## **2.2 Research and development of products**

In the early days that the product lines are disorder, most products of Apple are designed on the premise of technical feasibility. Latterly, Apple laid stress on taking convenience and sense of pleasure of the product use as its orientation. Teams of Apple develop products that can meet potential requirements of the market through observing consumers of the products and analyzing behavior of the consumers. The whole process of product development is designing, developing and mass producing. Taking designing as the drive of product developing and producing, it is also embodied the significance of designing link in the whole product developing process of Apple.

## **2.3 Design strategy**

Design Language of Apple can be defined as "less, but better". That is stressing briefness of product configuration and convenience of product use. It shows the resolution of Apple to bring consumers with more products that are easy to use. The most obvious example is "i" series products of Apple, especially for iPhone. It redefined mobile phone. The highly simplified and modernized appearance of iPhone (without keypad) blended multi touch technology which have consumers experienced a fire-new interactive mode through the process of calling, messaging and scanning website. The most important thing is combination of iPhone and App World (application program) changed life-style of people.

## **2.4 Production and marketing**

Through good cooperation and communication with ODM, Apple Company can devote much to the development of specific products and materials to ensure the products with a fresh and favorable user experience. Apple also follows the law of "Service First". That is their service for user starts before promotion of the product. Users can easily buy their favorable copyrighted music from iTunes while using iPod and conveniently find information that they need from the internet while using iPhone. Combination of hardware and software makes products of Apple more competitive in the market and leaves users a good experience of multi-dimension.

As point-of-sale terminal of Apple products, Apple Store has become new local landmark in many cities. Characteristics of Apple Store: first, all is for providing consumers with experience; when purchasing products in Apple Store, customers can experience the products themselves under the guidance of a staff; thus can deepen the visitor's acknowledgement and cordial feeling towards Apple. Second, friendly culture; customers can play mini game with experience equipments to relax themselves, even if they don't buy anything and join any activities.

## **2.5 Product strategy**

Product strategy of Apple stress on user-requirement-oriented. These requirements, which are established on the basis of experience and impression that has in users' mind, are expectations of users for the product and service. User requirements are distributed and dynamic. Different user groups have different requirements. Meanwhile, as user experience for products and services fatigued, user requirements will have a higher standard.

As the most vital and lasting "i" series products, except for iPod itself has quality performances and service items, product lines of iPod are also with a meticulous strategic layout. For instance, iPod Touch, which is relatively inexpensive, is regarded as an iPhone without phone functions. While besides traditional iPod music functions, it can run most of the application. Game and entertainment property of original iPod series products is largely enhanced. Thus the psychological need of low price, more entertainments of some users is satisfied.

## **2.6 Management and Leadership**

Management and leadership guarantees establishment of design strategy and its effective execution. As the company's management, one should have profound understanding and strategic thinking towards design. This had been vividly reflected by the former Apple company management which is centered on Steve Jobs.

### **2.6.1 Understanding of the design, attention to user experience**

Apple's management believes that the value of design is to provide consumers with first-class hardware and software experience, and products with aesthetic appearance. Therefore, they emphasize the strict control of details, which also inspired the best performance of Apple design team.

### **2.6.2 Powerful capacity of resource integration and implementation**

It is the strong leadership and strong execution capabilities of the management of Apple that endow it with a unique capability of resources control and integration. Once making clear the company's product design strategy, the management will put together the advanced resources of the company to provide security from the round of products' design and development, production, sales, which has laid a solid foundation for the good quality of Apple's products and their features.

### 2.6.3 Keen observation

The management of Apple can keenly capture the potential demand of customers and grasp available opportunities to come onto the market, which has provided powerful intellectual support for Apple Company to the drawing up of Apple's design strategies.

From the above analysis, we can see that Apple company's design strategy based on user experience has been effectively applied at all levels, forming a unified designed strategy in the internal of the company, which is to find potential needs of customers and design good user experience. (Figure 1) Under such a culture, Apple Company has rolled out products which are successful and of a subversive sense one by one, proving that those products with good user experience themselves are more attractive than products which merely win due to technology itself, changing the means consumers interact with technology in daily life of digitization. In addition, Apple bundles software, hardware with services to be designed, produced and sold together, creating a new business mode.



Figure 1 Apple design strategy and business model.

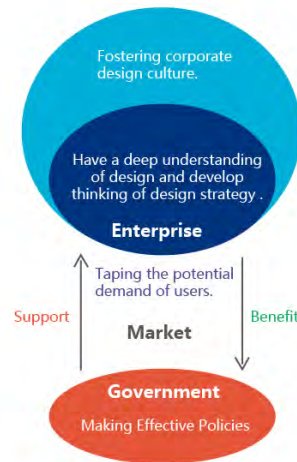
### 3 Thinking on Formulation of Design Strategy of Domestic Companies

At present, China is in an accelerating transition period of economic growth means, especially in recent years when those companies featured with OEM have been facing severe pressure to survive under the condition of a significant improvement on labor costs for domestic manufacturing and processing industry. Therefore, there are many items becoming important goals of China's economic transformation, such as accelerating the industrial upgrading of domestic enterprises and optimization of product structure, improving technology content of products, strengthening scientific management thereby stimulating domestic demand and achieving new sustainable growth model of China's economy.

As mentioned above, Apple's success proves the necessity of making design strategy based on user experience for the enterprises. However, Apple's experience should be promoted combining with China's national conditions, which will make it help domestic companies solve emerging problems in the transition period of economy in a better way.

1) The management of the company needs to have a deep understanding of design and develop thinking of design strategy. They should bear in mind that designing experience attracts customers better than designing shapes of products, with whose guidance, the management should integrate advanced resources to implement this concept in order to ensure that the products and services have good user experience.

2) Fostering corporate design culture. Based on the needs of users, the management drives the development, production and sales of the products through designs, thereby boosting improvement in technologies, improvement of brand value in order to mobilize the own power of the industrial upgrading of the company.



**Figure 2 Key factors of the spread of Design Strategy Based on User Experience in China.**

3) Through the analysis of user needs, feedback of user experience, and taping the potential demand of users, the management takes design as an effective business mode which provides important basis for the company in product optimization and drawing up of marketing strategy of the company. The management should allow users to join in rounds of design and production and guide the users to use and share innovation experience of the products so as to expand the group of consumers of the product and increase the competitiveness of the products.

4) The state should actively encourage and support enterprise to adopt user experience- based design strategy to develop high value-added products in order to build high-quality national brands and reduce the pressure and risk that enterprises face in the early period of development of products through effective policies. (Figure 2)

In China, there are pioneers who make design strategy guided by user experience, such as Internet technology company represented by Tencent QQ, e-commerce business represented by Taobao. Their products and services are attracting more and more consumers while also gradually gaining more and more right of speech in the market. Therefore, design strategy based on user experience can be summarized as follows: Starting from the user's needs and helping businesses and users to create a win-win business system with concepts of design strategy.

#### 4 Conclusion

As information technology continues to develop, people's lives will be fused with the Internet in a high degree. People enjoy more autonomy in choosing products and services. The consumers can select what they need according to their personal preferences ( feelings of experience ). Thus a good experience design is the key for products and services to win the market in information society. In the future, with the extension and expansion of Internet technology, people and objects, objects and objects can make smart dialogue, such as siri artificial intelligence voice program of iphone4s. As to products and services design based on the Internet of things, the scale that their users can experience will be wider while the innovation whose core is user experience will be the soul of development of the Internet of things. Therefore, design strategy based on user experience can be conducive to establishment and consolidation of brand systems for domestic enterprises, making their product and service have more competitive in the market to further acceleration on the industrial adjustment.

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## Research on Marketing Power Synergy Mode

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**Abstract:** After analyzing principle of marketing power synergy mode, the paper identified the order parameter as a leading power in dominate the marketing power system from a disordered state to a new ordered state in self-organization. The new synergic model is sum of the contact among each unit and the external environment when the marketing power of the synergistic effecting. On this basis, the paper identified the standards of order parameter in selection and management in critical or unstable state. Finally, it put forward complementary synergy mode and competing synergy model, which also raised three synergy operation modes as parallel- cross, project team and star.

**Key words:** Marketing power; Order parameter; Behavior pattern; Operation mode

### 1 Introduction

Marketing power has been causing wide attention in business community and the theoretical circles since been proposed in 1990s. When facing competition, changing enterprise capability into competitive advantage, marketing power is an important protection mechanism relying on internal and external resources, which is one of an very important criterion as enterprise capability. So researching on enhancing the marketing power is an significant topic both of business community and theoretical sector. The current study has been made certain results in terms of concept, construction and evaluation of the marketing power. By rational resources allocation, each power can be accordance with a certain degree of interaction, cooperation and collaboration, thereby enabling the overall system function has been doubled or enlarged. But in some areas, such as the management of marketing power, especially the rational allocation of resources, studies have not been involved. The key point of the marketing power management is how to make the marketing power of cooperation internally generated  $2 + 2 > 4$  synergies, external gain a competitive advantage. The core issue of marketing power of synergy must involve collaborative model. We should analyze the principle of pattern formation of marketing power of collaboration and explore each other related to the sum of the marketing power of collaborative formed. In these areas, China is still in its infancy, this study is based on this research topic.

### 2 Analysis on Principle of Marketing Force Synergy Theory

The marketing power synergy model is the sum of all connections among the synergistic unit, collaborations between the internal unit and the external environment when the marketing power system creating synergies on the basis of a clear system goal. Not only does it reflect the marketing power of the system interactions with the outside world, but also the ways and means of system synergy.

When the research system is exchanging resources, information and energy with the outside world, the marketing power synergy means how synergies within, to achieve the desired synergy mode and achieve the synergy of internal and external competitive advantage. According to the control theory and system theory, when the first derivative subsystem (capacity unit) parameter is zero, the target subsystem is called the optimal value under the meaning of the parameters of the subsystems in this state. However, due to the non-additivity as well as different state parameters defined, constitute the entire marketing power system capacity unit target optimal state parameters does not necessarily make the entire marketing force to achieve the optimal value. For example, two new recruits assigned to the power of product units or sales force unit allow the unit to achieve the best. But the benefits obtained by marketing power system under such distribution may be far smaller than the benefit generated two, respectively, assigned to the product strength unit and the sales force unit. In addition, the marketing power synergy is associate the core business of each capacity unit, making efforts to solve the bottleneck problem in the synergistic to make the marketing power of the system to a sustainable manner to achieve optimal efficiency and effectiveness. Marketing force synergy target is essentially the optimal value of the theoretical capacity unit in the collaborative process. The contact between the units is dynamic and the model is the theoretical optimal value approximation. Therefore, it is necessary to sort out the formation process of the contacts among the marketing power synergy units and lay the foundation for further improvements or to identify collaborative mode.

Professor Haken, the founder of synergy theory, put forward an important point refer to how to

identify the collaborative mode, namely, the process of pattern recognition is the process of pattern formation. System pattern formation process is firstly the initial state of setting is part of the ordering subsystem, and then the order parameter belonging to this subsystem is winning in the competition and dominate the whole system and make it into a particular ordered state, and finally complete the macro qualitative change of the system. So we can draw a conclusion from the description of the collaborative pattern recognition by Professor Haken that marketing force synergy pattern recognition process is the process of marketing power synergy model formation. Due to internal changes in the environment, the marketing power system is in a state of change or instability. Each parameter is also mutually competitive, by a series of parameters (including fast, slow parameter amount). But ultimately only one of the parameters overwhelms the other parameters. The most powerful parameter is the order parameter, which dominate the marketing power system to achieve self-organization and bring in new time structure, spatial structure or functional structure, from a disordered state to a new ordered state, and finally lead to the marketing power system to produce integral benefit larger than the sum of each unit. Since then, we produce a new mode of marketing force synergy (The formation of the model are as follows as shown in Figure 1). The new synergic model is the sum of the contact among each unit and the external environment when the marketing power of the synergistic effecting.

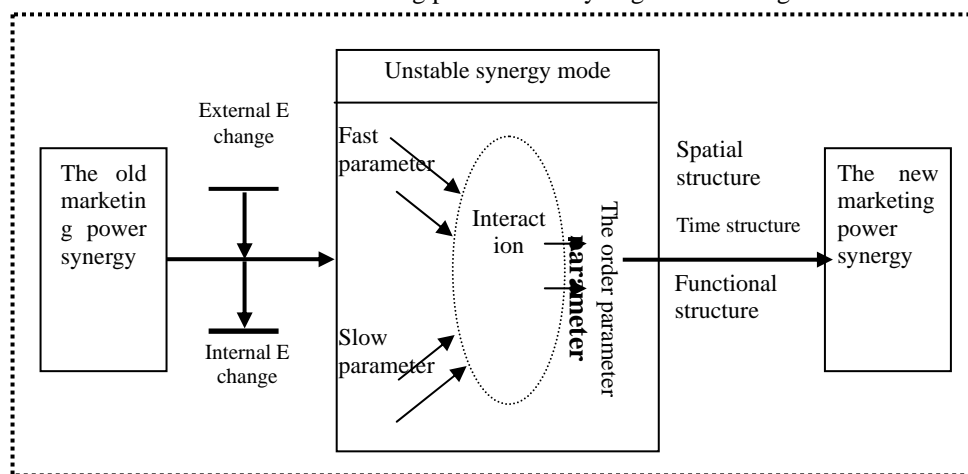


Figure 1 Formation Model of Marketing Power Synergy

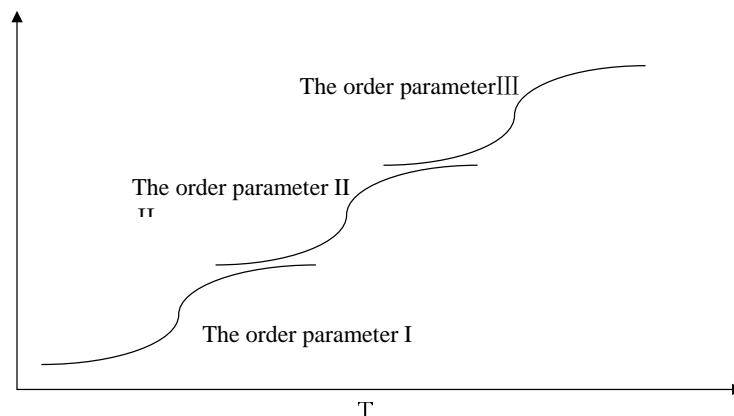
### 3 The Choice and Management of the Order Parameter

#### 3.1 The choice of the order parameter in marketing of power synergy

As an open system, marketing force system is subjected to the influence of various parameters. Some parameters have large damping and fast decay, no significant effect on the whole process of transformation, known as fast parameter. Some parameters, critically non-damping phenomenon and slowly decaying, playing a major role in the evolution process, are known as slow parameters. Although the slow parameters are only a few, it can control the whole process of system evolution and determine the structure and function of the evolution results. That is what we called the order parameter. All the subsystems within the marketing power of the system servo the system order parameter. However, what is specific order parameter that dominant the marketing force system to the order and collaborative mode? The research of this problem is still blank in China. With enterprises as the object of study, different scholars have proposed different points of view by analyzing the order parameters of the enterprise systems. These views have important guiding significance. One representative view is economist Schumpeter's innovation theory. He first proposed the innovation theory from the impact of non-balanced growth of the economic system. Schumpeterian attributed innovation to the entrepreneurial spirit, that is, the entrepreneur's ability to found and act the opportunities of innovation, taking the "entrepreneur" as the main organizers and promoters of "Innovation", the "new combination" of factors of production and economic development. It can clearly be seen entrepreneurship is the order parameter in the process of evolution. Collins and Bole Si believed (2003), the driving force of the core ideas and the pursuit of progress are determining the company's everlasting. So we can further extended the corporate evolution of the order parameter for what he called the core concept and the pursuit of progress. Fan Ming and Tang Xuejun believed that the (2004), sustainable growth of firms is the product of synergy generated by the elements of industry, technology, systems and market power, with relative

stability. Changes in the capacity of the sustainable growth drove the evolution of the various subsystems of the enterprise, and also drove the enterprise system growth capacity, and finally have direct impact on the selection and positioning of industry, corporate R&D investment and technological innovation capacity, updating and improving of management system, adjustment of organisational structure, staff training and incentives etc. Visible, they believe that the ability of the sustainable growth of enterprises is the order parameter of the corporate evolution. Liu Jianbo and Li bozhou believe that (2005), the enterprise organisational learning gene is the order parameter dominating the firms evolution. Due to the synergistic effect of enterprise systems within the subsystem, enterprise produce the learning gene of the organization, which dominating the evolution of the company. Pan Kailing and Bai Liehu believe (2006), the management of collaborative order parameter is not the only. There is a matter of choice; the choice of the order parameter depends on the specific environment. They also put forward the selection criteria of the order parameter, which has important guiding significance of our study. Pang Yong and Zhao Yanping believe that (2007), the core competitiveness of enterprises, which consist of five elements, that is, enterprise resources, technical capabilities, enterprise system, management capabilities and culture, is the slow variables of enterprise systems evolution. In order to form and ensure their competitive advantage, enterprises will continue to obtain the elements of the core competitiveness, establish and integrate the contact, and ultimately form their unique core competitiveness (order parameter). Yu Jie and Zhang Lan two scholars believe that (2010), regardless of what type of social system or in which level it is constituted, it has the leader of itself. Officials, managers and professors are the leader of their respective fields, leading political, commercial or academic areas. It can be seen that their role and status precisely reflects that they are "order parameter" of social systems. Leaders have all the characteristics and conditions that they should have as an order parameter of a social self-organizing system. Visible, they think leaders of the corporate are the order parameter of evolution.

As can be seen from the above scholars, the order parameter of the evolution of enterprise systems doesn't have a unified point of view. The author believes that the choice of the order parameter of the marketing power system should depend on the real environment. Marketing power of the system as an open system, the internal and external environment is constantly changing; the order parameter selection and cultivation should be based on different environments. When the order parameter is adapted to the needs of the environment, the system will be greatly promoted, fully mobilize external resources within the system and gain external competitive advantages. When producing a new structure and function by the pull of the order parameter, system environment will change gradually. When the order parameter is no longer adapted to the environmental requirements of the system, it is in an unstable state and the new order parameter will dominate the development of the marketing power of the system in new directions, resulting new round of growth and changes of the order parameter (Figure 2).



**Figure 2 Develop Routes of the Order Parameter**

Therefore, managers should assess the situation during the specific marketing practices, choosing the expected order parameter that dominating the evolution of system when the market in a critical state or under unstable state, hoping system developing in our favor by management. The choice of the order parameter of marketing power of collaborative should have the following characteristics:

- 1) The order parameter of the marketing power must be a macro parameter. It is the macroscopic

overall behavior generated by seven units, such as product strength unit and brand power unit, rather than a single unit reflected in the behavior.

2)The order parameter is based on resources, facing the competition, aiming to foster customer loyalty. It must be able to promote the effective integration and scientific use of the enhancement of its available resources, and the ability to dominate the system to obtain external competitive advantage in the marketing level.

3)The order parameter is the intrinsic parameter of the enterprise, transforming the corporate resources and capabilities into the marketing competitiveness and competitive advantage. Its formation is a product of the collective motion of the seven units, derived from the inner system, relying on the system of internal forces generated by one of the core parameters.

(4)The order parameter can dominate the behavior of each unit. Once formed, it would dominate the system to produce a new structure, function, and so on.

### **3.2 The management of the order parameter of marketing power synergy**

The choice of order parameter identified the direction of the system's evolutionary development. But the system, whether such as we expect, as the evolution of development, also depend on the parameter we choose, which "stand out" near the critical point of the system during the competition and really dominate the enterprise systems development. Therefore, the author believes that by managing the marketing power of the system, the system order parameter is developing towards the direction we expecting. Management of the order parameter of marketing power system should note the following.

1) When the order parameter is not adapted to new environment or the system is unstable near the critical point, we should actively create favorable conditions by reorganization of resources and process reengineering, reinforcing the parameters good to system development and negative the bad, ultimately enable the development of the marketing power of the system toward the desired direction by managers. For example, there may be some parameters, refer to efficiency, size or capacity when in a critical state, are likely to further evolve into the order parameter of the system. However, with limited resources or lack of funds, it is difficult to achieve economies of scale by additional capital resources. Then we can select efficiency as the order parameter, leading an orderly and stable development of the entire enterprise system with the existing resources.

2) Dominated by the newly selected order parameter by marketing system, we should note the controlling management, strengthen the effectiveness of management and reduce the interface problems, go to the direction by the fluctuation to the desired branch leap, improve the mechanisms, prevent the fluctuation of various unfavorable factors of internal and external to dominate the development of the marketing power of the system. And as follow-up work, we should continue to strengthen the order parameter to produce a self-organizing effect, and make the system to reach a new stable order.

## **4 Patterns of Behavior of Marketing Power**

The patterns of behavior of marketing power synergy not only reflect the purpose between the collaborative units, but can also reflect the way between the units. There are two kinds of collaborative patterns of behavior between the synergy unit.

1)Complementary synergy mode. Complementary collaborative model is a collaborative process, advantages (and disadvantages) of a collaborative unit match with disadvantage (advantage) of another collaborative unit, to make up the weakness in structure and function in order to achieve complementary advantages, and finally achieve system synergy target. For example, in a complementary collaborative mode, due to the different nature(like quality parameters) of synergistic unit, and the informative differences between actors, there are may be lead to two different forms of Complementary synergy relations, namely the symmetrical complementary synergy relationship and the non- symmetrical complementary synergy relationship. The symmetrical one is a stable marketing power synergy model, it shows that the synergy of consciousness and degree between the unit is high, while the non-symmetrical one is more unstable. The symmetrical complementary synergy relationship is the ideal form of the complementary synergy patterns. For example, the relationship between the R & D department and sales department of the product power unit. Let the sales department to know of new products when the R & D department in new product design stage, and know the attitude of its new product features. The sales department also tells the product unit of information from customers, competitors and technology. When each unit have further consensus on the new product features, we say they have symmetrical complementary synergy relationship between product unit and sales unit, or non-symmetry of complementary relationship.

2) Competing synergy model. This model means the competitive and cooperative relationship between synergistic units under the premise of ensuring the system objectives. Each synergistic unit compete with each other within the system resources, but also benefit with mutual interaction, promoting the marketing power rational flow within the system resources between units. The synergy between the units is stored in an enterprise environment between two or more synergistic unit. It is a system behavior, a system of social behavior, also an important part of an integral part of the market-oriented content. Competition is in order to allocate more resources in the marketing power system, and cooperation is in order to obtain external competitive advantage. Therefore, to some extent, such model is belonging to competitive synergy. Get information is the inevitable performance of this competitive collaboration, which is called intelligence by some scholars. Therefore, the penetration of the competitive intelligence is a decisive factor in synergistic units. The more fully penetrate intelligence within the system, the higher the degree of synergy between the marketing powers of the system unit.

## 5 The Operation Mode of Marketing Power Synergy

### 5.1 Parallel- cross synergy mode

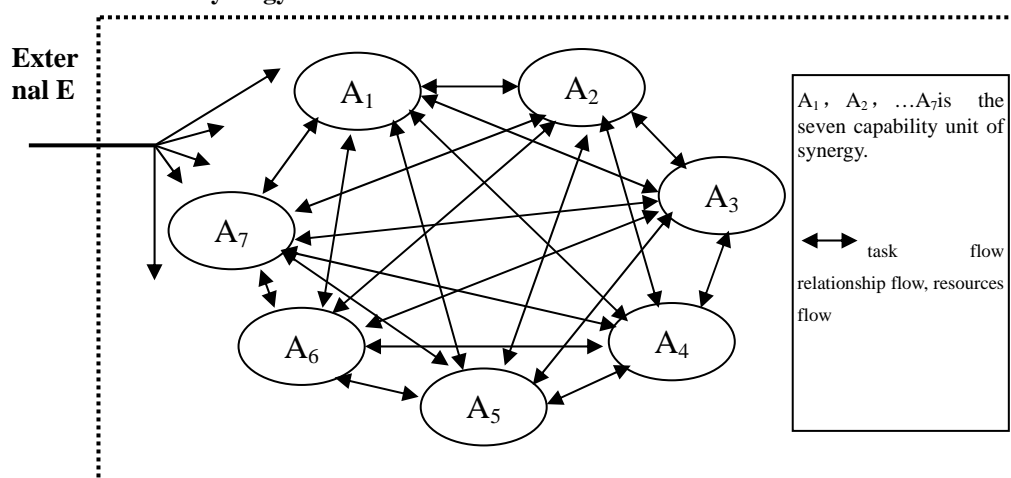


Figure 3 Parallel-Cross Synergy Mode

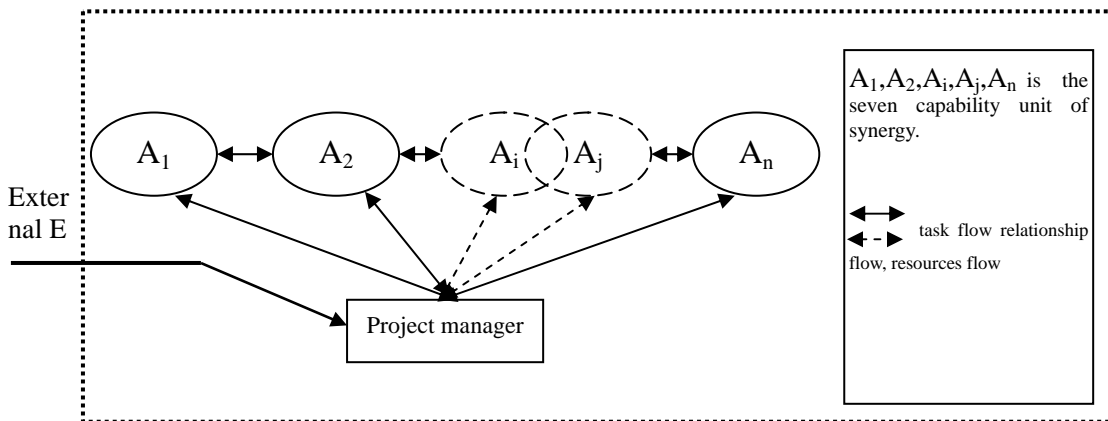
Parallel- cross synergy mode refers to a marketing power synergy unit directly connected with another synergy unit. The synergy between the units and the synergy relationship between the unit and the system environment shown in Figure 3. In this parallel- cross structure, Each capacity unit connected other units through the interface  $f_1(x, t)$ ,  $f_2(x, t)$ ,  $f_3(x, t)$ . The flow of information and material between the system unit is directly from the starting point to reach the terminal, no intermediate links, breaking the traditional system collaborative process which have different logical associations before or after. Within the system, each unit composed of more than one professional group to work together. The process within the system unit is just like a criss-cross network, to ensure eliminate some duplicate links in units synergy, greatly enhance the efficiency of the system of collaboration. For example, when the business in growth stage, the goal of the marketing power system change into the pursuit of market share maximization. The marketing power synergy unit may have four possible outcomes. First, the product units will improve product quality, expand the extension products of the service assurance, increase the product features and style, look and enter the new market segments. Second, the price power unit should mainly rely on the penetrate pricing way, attracting more price-sensitive buyers by lower prices. Third, the channel power unit should use intensive distribution, expanding distribution coverage and open up new channels of distribution. Fourth, the sales force unit should convert from improve visibility to stimulate consumer interest, preferences and desire to buy products, from the product understood to product preferences. However, these units synergy behavioral strategies are not mutually independent, but the co-ordination between each other, understanding the need of each unit. For example, if turn form popularity to product preference, it need match with the good quality of product unit, the temptation of price unit, the convenience of channel unit and so on. These are directly passed from the starting point to the end. The information transmission path is significantly shorter. The distortion of information is also greatly reduced, also greatly improving the efficiency of the unit collaboration, allowing the system to generate synergies. Another advantage of parallel- cross synergy

mode is the flow of information and substances. When close co-operation of each unit, it can generate new ideas and concepts. Some companies in Japan, especially the auto manufacturers, significantly short its product development cycle, greatly improved the efficiency of product development by this synergy, and thus becoming another competitive advantage for the Japanese automotive products and Europe and the United States company.

Stable operation of the parallel- cross synergy mode need a highly collaborative spirit of marketing power system. Not only requires the collaboration of high accuracy, but also the strong management and coordination capacity and rapid decision-making ability. Similarly, as the business becomes bigger, the number of internal interface and manage the workload was increased in geometric progression type. Therefore, the parallel- cross synergy mode is generally more suitable for the marketing power system of small and medium-sized enterprises.

**5.2 The project team synergy model**

The project team synergy model is marketing power synergy models that project manager manage the project subsystem, which composed of the main capacity modules in a project. The relationship among synergy unit, the project manager and the environment is shown in Figure 4.



**Figure 4 The Project Team Synergy Model**

One of the main features of the project team synergy model is that it involves several units of the project tasks to form a new subsystem, within each unit only one project manager interface management. This greatly reduces the efficiency losses resulting from synergy units across the boundary interface management, further strengthening the work communication and responsibility, improving the efficiency of project tasks completion. For example, the task of product innovation projects mainly related to the product force unit and the sales force unit. In new product design stage, the power unit should ensure that the sales force unit knows the views of its products. Sales force unit should inform the information from customers, competitors and technological progress to the product power unit, making some recommendations on products. By exchange views, this let the product power unit and the sales force unit reach an agreement in many ways in the beginning of the project. In the initial commercialization stage, product unit give some advice to the sales force unit to open the market in the development of marketing strategies. In the sales phase, the product unit and sales force unit serve the users of new products; maximize its value of product innovation. Another major feature of the project team synergy model is to solve the temporary problems in the marketing power system. The project team horizontal joint capacity units involved project tasks. These capacity units, as members of project tasks, solve problem together, thus greatly strengthening the response time to threats or opportunities in marketing power system, while avoiding disadvantages and turn response time to external competitive advantage.

With the global market diversification, increased demand for complex and personalized, the enterprises are facing severe challenges and important opportunities for development. Especially the opportunities for development, is an instant changing. Enterprises should seize this opportunity to become more flexible system. The project team synergy model is the product of this environment requires, which can meet the opportunities and threats of a sudden. At the same time, focusing on customer needs, and more commercialization of the demand put forward higher requirements for the constitution and operation of project team synergy model.

### 5.3 Star synergy mode

Star synergy mode refers to a collaborative body formed by various synergies between the marketing powers of synergy unit by the central synergy unit. The relationship between synergy unit, the unit and the external environment is shown in Figure 5.

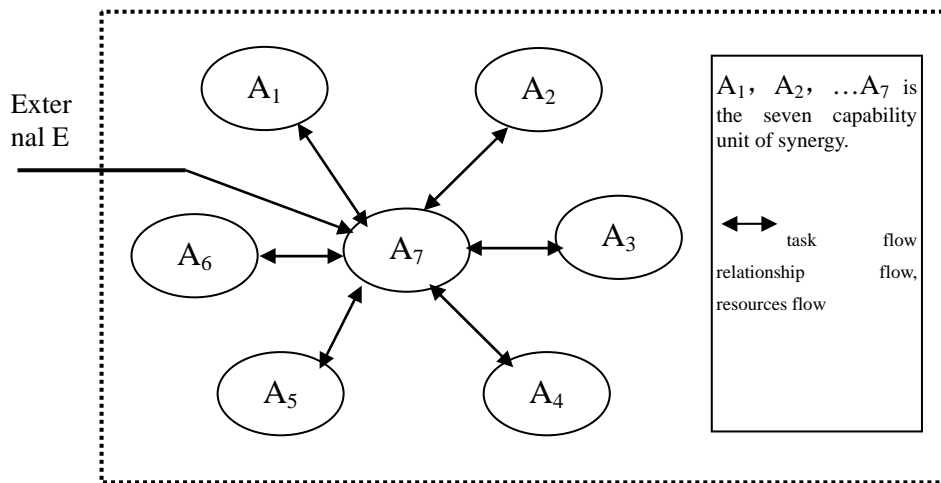


Figure 5 Star Synergy Mode

In it, A7, located in the middle, is a core competency unit. In addition to the work of unit itself, the core competencies unit is also responsible for the strategic management, the development of the infrastructure of the organization and management sharing by other capacity unit, enabling each department to cooperate with each other, ensuring a unified mission and purpose of the role. Other non-core competencies unit star-shaped is arranged in star type. They are interdependent and help each other on key issues, equally of status with core competencies. For example, in the production concept, the companies believe that consumers always love low-priced products, so the management is always committed to high productivity. In this concept, the product power unit is at the core of the star patterns synergy.

One of the biggest advantages of the star synergy mode is during the collaborative process, the transfer of resources and the information between the marketing power systems is achieved by the core unit. This greatly reduces the interaction between the interface  $f_1(x, t)$ ,  $f_2(x, t)$ ,  $f_3(x, t)$  of each capacity unit. Also thanks to this proxy mechanism, when one of capacity unit is changed, only need change the corresponding part of the core competencies unit, the complexity of the marketing power system maintenance and upgrades. For example, star collaborative model is applicable to any kind of marketing power collaboration system of the high-tech enterprise, because it can be adapted to the rapid change in market and technology areas. Of course, the star synergy model also has some weaknesses. First, as a core unit of star-shaped collaborative mode, there must be equipped with some complex talent who aware of the ability of other units. If the talent selection is not appropriate, it will add to the collaborative interface between the units, reducing the efficiency of collaborative. Second, as a core unit of star-shaped collaborative mode, it must be fair and impartial, and dealing with interface issues should always be in line with the overall interests of the system, not intentionally partial to any side, otherwise it would be the interfaces between the ability of unit deteriorate.

## 6 Conclusions

Marketing force synergy is a new area of research. The synergies of marketing power are generated by the synergy unit, synergy conditions, synergy interface, and synergy mode of these four areas. Among them, the marketing power synergy model is the sum of the contact when marketing power unit creating synergy, it is the result of optimization. So, on the basis of synergetic pattern recognition theory by Professor Haken, the author study the principle of marketing power synergy mode, determine the standards of order parameter selection and management according to the characteristics of growth and change. On this basis, the author put forward two synergy modes, complementary synergy mode and competing synergy model, also raise three synergy operation modes, parallel cross synergy mode, project team synergy model and star synergy mode.



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# The Influence of Culture on Work Motivation in Bolivian Managers

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**Abstract:** The study evaluates which were the most frequent motivational factors among 150 candidates for management positions in La Paz City (Bolivia). The results showed that the behavior of the sample is directed by the motivation for “membership”. On the other hand, international scales show significantly differing results, which indicate that managers are directed in their behavior by the “achievement” motivation. This work concludes that the differences obtained are due to cultural factors, which are scarcely investigated in psychology of work and, hence, not used in business management. This paper also concludes that the role of culture on the motivation of business managers cannot be avoided since it influences the performance of the company and the country.

**Key words:** Culture; motivation; Collective culture; Individualist culture; Managers

## 1 Introduction

The importance of organisational culture and climate has been the subject of relevant interest since the 80's until today, no longer leaving off to be a peripheral element in organizations to become a strategic element of high importance.

The development of organisational culture allows to members of the organizations certain behaviors and inhibits others. An open and humane work culture encourages participation and mature behavior from all members of the organization, if people are committed and are responsible; it is because the work culture is a strength that allows organizations headed towards excellence toward success.

The organisational climate is determined by the perception that employees have of the cultural elements, this includes the feel and the way people react against the characteristics and quality of organisational culture.

In the field of occupational psychology one of the problems facing Latin American countries is that for various reasons, most studies of organisational behavior have been conducted in the United States and Western Europe. Reasons, including greater ability to access funds for these studies, large number of researchers to exchange ideas on related topics, and expectations for professional career development has the power to investigate and or published, these are some of the reasons that cause Latin American countries intellectually nourish from these countries. This geographical imbalance in the research entails the risk that the theories developed in one part of the world can mistakenly be taken as universal, and therefore wrongly used in other countries. Bechtold D.J. and others (2002) question whether the individualistic nature of theoretical concepts frequently used in studies of organisational and consumer behavior as: motivated leaders to reach personal goals, consumer purchasing decisions taking individual employees motivated by extrinsic reinforcement and character individual may be applicable to other cultures.

Today's management theory used in Bolivian companies, shows a list of conducts considered necessary to achieve executives who lead successful organizations, these behaviors have been obtained from investigations of individual cut which seem to be unresponsive to the country's cultural characteristics. The Bolivia culture, like most of Latin America's, is of collective character; researches in these cultures show an influencing factor of motivational processes in relationships between people who share the same social identity. In these cultures, leaders have obligations to his or her subordinates, and often act in a paternalistic way that would be unacceptable in individualistic cultures (Aycan, 2000; Hui and Luk, 1997, Sinha 1994). Here, workers collectively set goals, or with other group members, which seems to motivate them to achieve goals, since they seem not want to fail at their group. Triandis et al, (1989) argue that collectivism requires the subordination of individual goals to collective goals whereas individualism promotes people's pursuit of goals that are important to them, and even change their groups to achieve them.

## 2 A Case Study

The case study helps to show that motivation and culture are related concepts, which leads to the

question: what is the motivational factor with greatest influence on the behavior of the Bolivian business leaders and in what extent culture influences it?

This research seeks to answer this question from the Bolivian reality, where cultural issues has been a little related to factors of production and human resource management, there is now an effort to study the culture, determine their impact on different aspects of social and economic life. The study is part of this line, in a quest for greater understanding of those motivating factors that govern the behavior of Bolivian managers and may differ from the behaviors valued by management theory recognized internationally.

For this purpose is considered a study in Bolivian manager applicants; their reaction and response to a series of study according to the impact of belonging a new job environment and their most nearest goals within the company and within their work group. This research was made in order to determinate the cultural influence in the leaders motivation, whether is address depending on their own social acceptance as individualist or collectivist culture people.

### 3 Methodology

The work was carried out with 150 candidates for management positions, of both sexes. All professional degree, preferably with a master, knowledge in English and executive experience at least 3 years in management positions, recruited through a notice published in newspapers in the city of La Paz (based on the International Electronic Magazine of the Latin American Union of Psychological Entities)

#### 3.1 Instruments

According to the psychosocial motivations of Fernández Seara scale, consisting of 5 factors, this study consider them next:

**Table 1 Fernández Seara Scale**

Membership	Each Factor consist of 5 components	Activation
Social recognition		Expectation
Self – esteem		Execution
Power		Incentive
Security		Satisfaction

Source: International Electronic Magazine of the Latin American Union of Psychological Entities (2002)

### 4 Results

The subjects, who were applied by survey of motivational factors, showed that the main motivating factor is the “membership.” It is characterized by the need to socialize, to be socially accepted and have security in interpersonal relationships. In these people, social contact that provides them with knowledge about the self and the world, social contact is the one that reduces uncertainty, which gives them emotional and cognitive stimulation. So, it is through their group that can create a dignified image of him or herself.

The results show that the factor “membership” is the first position into 4 components analyzed: “activation,” “expect,” “execution,” and “satisfaction”, placing the component “incentive” to the second position (see Table No 2).

**Table 2 Results of Motivational Survey**

Activation Component	Expectation Component	Execution Component	Incentive Component	Satisfaction Component
Membership	Membership	Membership	Achievement	Membership
Achievement	Achievement	Recognition	Membership	Achievement
Power	Recognition	Auto-esteem	Recognition	Recognition
Recognition	Auto-esteem	Achievement	Security	Auto-esteem
Auto-esteem	Security	Security	Auto-esteem	Security
Security	Power	Power	Power	Power

Source: Own elaboration, based on International Electronic Magazine

At the level of “activation” component, understood here as the energy needed to start a particular process, “membership” is significantly higher to the universal average  $n_s > 0.05$ . This can be found in Figure No. 1, where it is perceived that the results of our study are shifted to the right in relation to the international scale, showing that our sample is willing to drive, move and direct their energy towards seeking

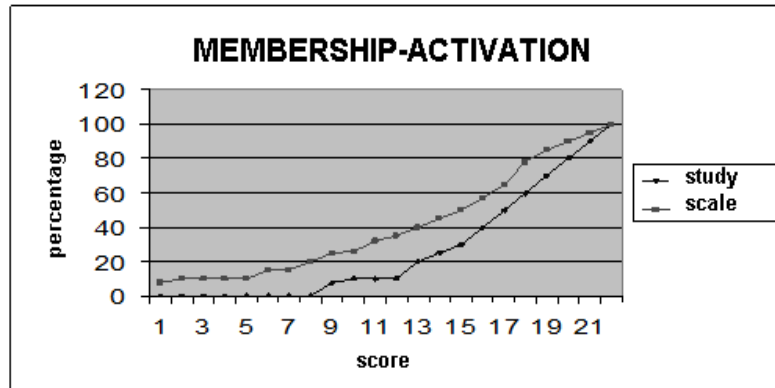


Figure 1 Membership - Activation (Own elaboration)

“membership” more intensely than the average scores of the behavior reported by managers of companies from other countries.

The component “expectation” is related to the effort made by the person for what he or she considers most likely to happen. Here, the results also indicate a “membership” as the most important factor, that would mean that our executives hope to gain acceptance of their group more than they expect to get the international managers average. This can be notice in Figure No. 2 where the results of our sample are also shifted to the right,  $ns > 0.05$ .



Figure 2 Membership - Expectation (Own elaboration)

The results of the component: execution, reinforces those obtained from the other components, showing that Bolivian executives are willing to strive, to execute actions, to get moving, rather than the international average for the acceptance of their group. Here we can see like in the previous figures, the sharp rightward shift in our sample, which corroborates the results. (see Figure No. 3)



Figure 3 Membership - Execution (Own elaboration)

However it is interesting to notice that for the factors: “incentive” and “satisfaction,” the motivation to “membership” is shifted to the left in relation to the universal parameters, and it can be interpreted as the fact that our managers are seeking the "membership" they hope to achieve it, they strive for it but might be not personally satisfied.

Even if the factor “satisfaction”, the “membership” is first choice for our sample, and the second for the factor “incentive”, these are lower than the international extent, corroborating the interpretation that there is a disconnection between the satisfaction of being accepted by the group and the subject's innermost desires.

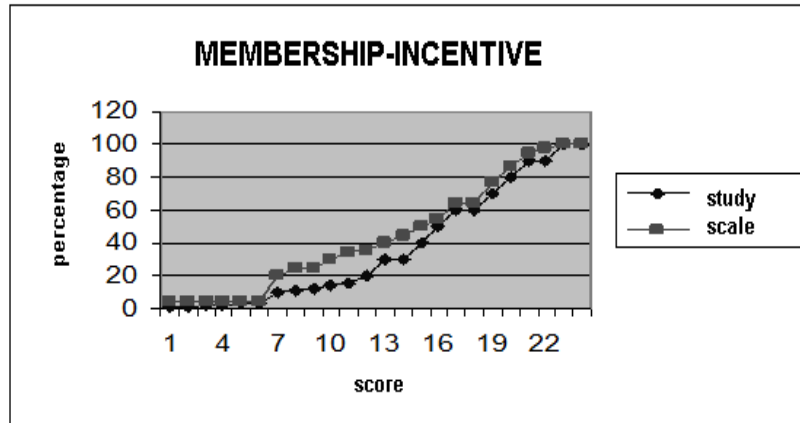


Figure 4 Membership - Incentive (Own elaboration)

To these results must be included the correlation age and “membership”, showed an inverse correlation, i.e. the higher age the lower pressure to the “membership” as motivating. The “Membership” is the main motivator for ages about 20 to 45 years, but not for managers older than 50 years, where this stopped being an important need. The subjects at this age are looking to meet other needs as the “achievement” or “self esteem”. This may be due to the age of 50, the subject looks into himself or herself, leading him or her to seek the satisfaction of other needs such as personal fulfillment.

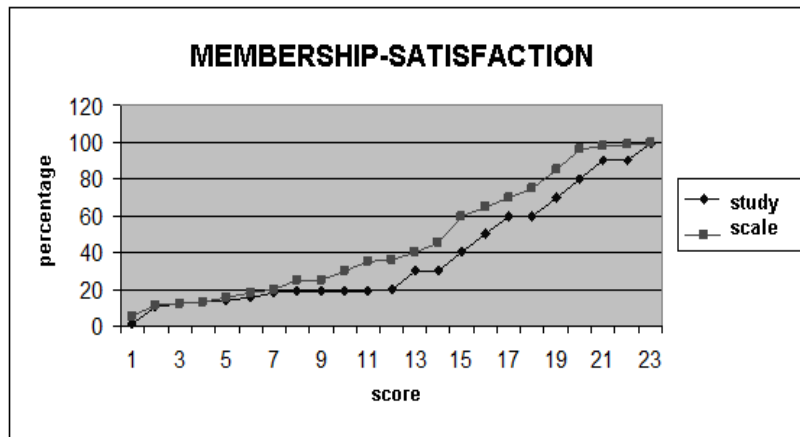


Figure 5 Membership - Satisfaction (Own elaboration)

### 5 Conclusions

The variance analysis performed allowed us to see that the motivation for “membership” is the most important in our sample to four components. (activation, execution, expectation and satisfaction). These results lead to assume that the motivation is not just individual or about the company, is also a result of the culture the individual comes from. People from cultures with collective dominance, where it is reinforced group values (as the case of Bolivia), would be oriented to the membership, which causes to have an image of himself or herself more dependent of the group, being less sociable with the out-group than subjects in individualistic cultures, and be motivated to membership on all of intimacy, it means they seek to be accepted by their close group allowing them to obtain warm and intimate

relationships that protect them from fear of rejection. In such societies it is reinforced the values of benevolence and egalitarian commitment.

Even the fact that Bolivian managers are satisfied mostly by the factor of membership is not enough to satisfy their individual level, this could be because the subject is immersed in two different types of information on one hand the company will demand a type of motivation and the culture demands a different one as well, this would produce a dissociation in the subject. It is also interesting to notice previous studies that say: people in collectivist cultures expressed slightly higher scores on distinctiveness (it is annoying to them that others do things better and enjoy being the only ones) than subjects in individualistic cultures, this could also explain the lower results in the international parameter obtained in the incentive and satisfaction components.

The results of this study indicate the need for further studies in culture and occupational psychology. Workers in psychology must not forget that the image of man is of an ideological character, therefore is necessary to examine the existing society and ideology in a particular historical moment since the reality where men move into his social environment. Hence, be the culture, which develops the motivational provision that the employee brings to the company. Therefore, further research is needed on how culture affects the style of motivation of our managers and deepens understanding of this issue, such psychologically, socially and administratively level. We must conduct researches that allow us to create organizations that respect our idiosyncrasy and our values, to achieve individual development and create internationally competitive firms. Continue copying business models of nature individualistic cultures and applying them in subjects living in collective societies, will be achieved only discourage them and still generate a feeling of uncertainty caused by the demands of their society at odds with the demands of western administration.

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# Reform and Innovation of Publishing Process Based on the Theory of Project Management

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**Abstract:** In the research, work stages and management process of publishing process reform and innovation based on project management were analyzed and classified. To improve management ability and work efficiency, traditional publishing process should be re-divided and recombined, because the divisions of work stages and management process are the basic work of project management. In addition, a solid foundation will be laid to the follow-up reconstruction of organization in this way.

**Key words:** Project management; Work stage; Management process; Publishing process reform

## 1 Introduction

A project is consisted of implementation process and management process that includes the plan, implementation and control of the project. To improve work efficiency, a publishing program will be classified in several stages that are easy to be managed and all the stages can be further divided into a series of specific management process according to the characteristic of publishing industry and some conditions in the process of implement of publishing programs.

In project management theories of all kinds of stages are the key symbols to the division of the project. It is apparent that some project work that has same points will be divided into a same kind of project stage. Moreover, integrity of the outputs of the project is another important sign. Some key production can be obtained with all work of the project stages finished. The production is the export of the project stage that has been finished and it is also the import of next project stage that will be continued or the end of the project. All the work of the whole project can be regarded as an entire project life cycle of a series of project stages based the theory of project management.

## 2 Literature Review

Project management began in the 1940s and project management was applied in the national defense construction and industrial (civilian) engineering construction in the developed countries during this period. In the 1960s, many researchers did research on the theory of project management in the world. In the 1970s, project management was introduced to China from western countries and it was applied widely in national defense, construct and software engineer. And project management theory was brought in Chinese publishing industry in 1990s. Some presses like China Higher Education Press tried "the project thread". However these presses did not do undoubted project management, what they did provided new management ideas to publishing project management to cultivate talents and organization of publishing industry.

Du Linzhi (1998) raised project responsible system first time and he thought project responsible system is a efficacious method to supervise and control the publishing process.<sup>[1]</sup> Zhou Xiaoli (1999) probed project responsible system and studio system.<sup>[2]</sup> Hu Yongxu (2000) discussed the basic concepts of project management, book project manager and the cost management of book project. It was the first time to put forward the publishing project management in China. Yunfeng Chen (2001) discussed possibilities and procedures of carrying out project management to explore the ways of book project management. Wang Ping (2002) explored project management and the application in publishing process. More and more people (2003) started to do research on project management and many papers were published. Feasibility, necessity and applicability of publishing project management was discussed and analyzed. Mo Xiaodong(2004) elaborated the advantages of the concept of publishing project management and implement of publishing project management clearly. Yang Ping(2005) indicated that compound organization was fit for book publishing activities and confirmed the duties of project managers. Li Xinniu(2006) elaborated the press make full use of array of organization structure and analyzed the advantages and disadvantages of array of organization structure. Form the paper, they analyzed how to bring in project management and introduced some ways of project management in some areas by conceiving the organization structure of publishing project management. Liu Jian (2007) divided the publishing project system into three forms: subject selection project system, subject

selection and delivery project system and subject selection and sell and delivery project system. The publishing project system was a kind of organization form and aim responsible system that optimized the organization to finish a publishing project. Shen Qiao(2008) explored the duties and quality of publishing project management editor in the digital publishing environment. Yan Yuxi (2009) presented the applications of project management theory in Shenyang normal university book digital reform. Li Ruimin(2010) introduced features of book publishing project. He also expounded book publishing project management ways and implement process and summarized the cause of accomplishing the publishing project and insignificances.

The development of project management was a constant expanding process according to analyzing 92 papers discussed project management and publishing. In this process, scholars learned the project management more profoundly and more clearly. The project management theory was applied in many different areas and more companies and feasibility, necessity and restricting factors of project management were more comprehensive.

### 3 Reform and Innovation of Publishing Process<sup>[4]</sup>

A publishing project can be divided into four primary work stages. (1) Selection of the theme and decision-making of publishing project. (2) Design and plan of publishing project. (3) Implement and controlling of publishing project. (4) Accomplishment of publishing project.

The management process of publishing project can be described by Gantt chart as the shown in Figure 1.

Project process	Starting date	Days	End date
Information collection and processing	2008-01-20	300	2008-11-15
Project approval	2008-11-16	24	2008-12-10
Time and costs control	2008-12-10	10	2008-12-20
Fields of study	2008-12-21	7	2008-12-28
Allocation of resources	2009-03-02	7	2009-03-09
Time and costs control Implementation	2009-03-10	400	2010-04-14
Evaluation	2010-04-20	21	2010-05-11
Revision	2010-05-26	60	2010-07-25

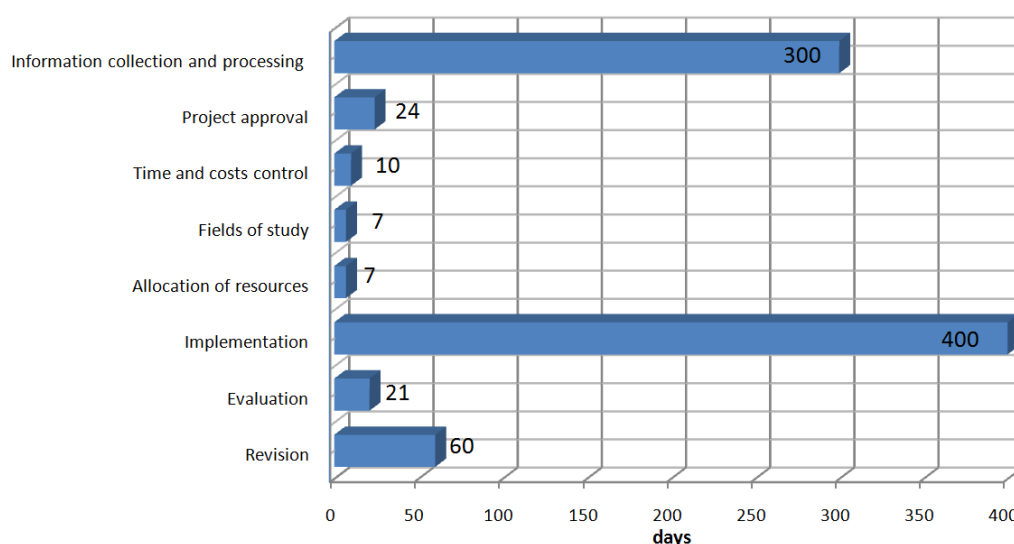


Figure 1 The Gantt Chart of Publishing Project

#### 3.1 Subject selection and decision-making

##### 3.1.1 Identify opportunities and demands of the publishing program

First, the manager should know the demands of readers to carry out a project. Based on premise, members need to analyze the demands of readers further and put forward basic ideas. Then, the manager should analyze and identify whether it is a good development opportunity to the company. This is a very



challenging job since it contains analyzing the publisher internal conditions and the external environment and opportunities. After the feasibility analysis is done, the manager will make it clear that whether the project can solve the problem faced by the publisher.

#### 3.1.2 Put forward topic selection report

The second task of subject selection and work of decision-making phases is putting forward topic selection report. The specific requirements of the publications need to be pointed out in detail. These requirements include getting the ways of measuring project performance, quality, and economic benefit index and the ways of measuring the number of project output, quality, technology and economic effects of the technology and other aspects of the specific index. The specific standards and regulations of the publication should be practical and feasible and can be measured. Finally, these standards and regulations will be the basic standards to check the work performance and the publication quality.

#### 3.1.3 Study the feasibility and make decisions

In general, the project proponent, the project owner or project manager is responsible to complete the project. Meanwhile, researchers must be responsible for the authenticity, accuracy and reliability of the study. Project feasibility analysis report must get the approval of the topics demonstrate commission and the important topics must be submitted to the authorities for approval. The approval process of the report is the final decision-making process.<sup>[5]</sup> After the topics report is approved, this document will be the basis of investment decisions, design of process, financing, resource allocation and implementation plan in the future, and will be the basis of the final assessment when the project is finished.

### **3.2 Planning and designing of publishing project**<sup>[3]</sup>

#### 3.2.1 Develop publishing project integrated plan

The development of integrated plan which integrates a variety of specific plans is a schedule of overall work of the publishing project. The result of the publishing project plan is to acquire a guidance document which guides the implementation, control and harmonization throughout the whole project, for instance, to guide the implementation and control of the whole project, to coordinate between the work and the specific plans, to coordinate and facilitate the communication among the stakeholders, to define the content, scope and time of the work, to provide the standard and to provide baseline of performance measure and project control of the work.

#### 3.2.2 Develop specific plans of publishing project

The development of specific plans, the process of which is to make various plans for a variety of professional work or specific work due to different targets, is a schedule of all aspects of specific work in the publishing project. The result of the publishing specific plans is to acquire a series of guidance documents which guide the implementation, control and harmonization of every professional and specific task, for instance, to guide the implementation and the control of a professional or specific work in the publishing project, to coordinate the interest communication among all the aspects of every professional or specific work, to define the content, scope and time of every professional or specific work, to provide the standard and baseline of performance measure and project control of every professional or specific work, and so on.

#### 3.2.3 The design and provisions of publications

The design and provisions of publications are not only the physical description of publications, but also include the work of technical design, implementation scheme design, and technical specification design. These works make comprehensive requirements and regulations from the perspective of technology, quality, quantity and benefit.

#### 3.2.4 The outsourcing and contract conclusion of publishing project

The work of publishing project needs the coordination of outsourcers and suppliers. In the phrases of reviewer and print, in spite of signing contracts with authors, outsourcing is usually involved. All these jobs are within the scope of schedule, that's the reason why it falls into this phrase.

### **3.3 The session of publishing project implementation and control**

#### 3.3.1 Develop the standard of controlling publishing project

The primary task of this session is to develop the standard of controlling project in the process of which the management basis and baseline needed in the whole session of publishing project implementation and control phrase are settled. The management basis and baseline include standard of controlling quality, progress, costs, resources and labor, which are the key factors that will lead to the final success of the project.

#### 3.3.2 The work of publishing implementation

The primary work in the session of publishing project implementation and control are as follows, choosing proper freelance writer, auditing, editing, typesetting, proofreading, format designing, decoration designing, quality inspecting, printing, advertising, etc.

#### 3.3.3 Command, scheduling and coordination

In the activities that formulate production, the project manager ought to keep the whole publishing procedure in order and move on with reasonable resource allocation through the management measures, such as command, scheduling and coordination.

#### 3.3.4 Performance evaluation and reporting in the publishing project implementation

In the work of publishing project implementation, performance evaluation and reporting must be given on schedule. The performance evaluation is to compare the actual results in implementation with the project control standard. Reporting is to gather statistics, make contrast, analyze and report the actual situation of the project implementation work.

#### 3.3.5 The corrective actions in the publishing project implementation

One of the most important works in publishing project implementation and control management is to take various measures to eliminate deviation according to the performance evaluation and reporting so that the project implement to the right direction orderly. The deviation rectification includes the corrective measures aiming at personnel organization and management, resource allocation and management, improvement of process and methods, and so on.

### 3.4 Completion and delivery of publishing project

#### 3.4.1 The completion of publishing project

The major work in the session of publishing project completion includes the completion of various jobs and outsourcing contracts involved in the project. Each work is to be verified and evaluated according to the topic selection report that is the key point in the project proposal while end the cooperation contracts with various outsourcing companies by check and acceptance.

#### 3.4.2 The delivery of publishing project

According to the project management theory, the delivery of a project includes two aspects, the acceptance and delivery of both material productions and property rights. As for publishing project, the delivery is not perfect since the enterprise system and property rights are not that clear. However, this is one aspect that is to be improved in the long run for the publishing company. Acceptance and delivery of publication, the production of publishing project is executed according to the publication quality management regulations from the perspectives of both quality and quantity.

## 4 Conclusion

By the division of sessions and management procedure based on reform and innovation of project management theory, operation management of publishing can be categorized into project management, which can improve the efficiency and interest of publishing work. It's a basic work for traditional extensive management transformed into a modern refinement of management. Only the re-division and reorganization of the traditional publishing process can help conduct project management better and lay a solid foundation for the following adjustment and implementation of organisational structure.

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## Justification of Ethical and Unethical Dilemmas in Human Resource

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**Abstract:** In this paper, we have tried to explore some of the major dilemmas surrounding ethical and unethical behavior. We have used approaches, cases and myths to justify questions such as to why employees commit unethical practices, the difference between ethical and unethical behavior, whether one ethical behavior can supersede an unethical behavior and the relationship between stereotyping and unethical behavior. This paper thus draws a conclusion that moral values and norms are critical to be taught to a person from childhood and with time they become wise and by the time they reach a workplace, they are full of wisdom, which is the only way to choose between right and wrong, no matter how thin the lines

**Key words:** Unethical; Ethical; Employee; Approaches

### 1 Introduction

Many companies, all through out the world have been at the receiving end of scandals resulting from unethical practices from its very employees. Enron has been the major case that most people use as a reference. Finding the reason that leads to unethical behavior will help us in trying to avoid those situations from happening in our companies. Justifying why one commits and unethical practice, how to differentiate between ethical and unethical practices and the relationship between stereotyping and unethical behavior are the major discussions of this paper. We have used Values theory to justify most of our findings. Values represent basic convictions that “a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence. They contain a judgmental element in that they carry an individual’s ideas as to what is right, good, or desirable. Values have both content and intensity attributes. The content attribute says that a mode of conduct or an end-state of existence is important.

### 2 What Motivates an Employee to commit an Unethical Behavior?

#### 2.1 Theory

Corruption as unethical in this context are broken down in two, one is with theft the other without theft <sup>[1]</sup>. One would spend ages trying to figure out why an employee commits an unethical behavior. Some employees are well-off but still follow the unethical path. When we view this from an Organisation Behavior perspective, there is one theory that explains it all. Regarded as the most well-known theory of motivation, Maslow’s Hierarchy of Needs is a theory that hypothesizes that within every human, there lays a hierarchy of five needs.

(1)Physiological – includes hunger, thirst, shelter, sex and other bodily needs.

(2)Safety – security and protection from physical and emotional harm

(3)Social – affection, belongingness, acceptance and friendship

(4)Esteem – internal factors such as status self respect, autonomy and achievement and external factors such as recognition and attention

(5)Self Actualization – drive to become what one is capable of becoming; includes growth, achieving one’s potential and self-fulfillment.

As each of these needs become satisfied, the next need becomes dominant. As represented in Figure 1, an individual moves up the steps of the hierarchy. This theory suggests that although no need is fully gratified, a substantially satisfied need no longer motivates. Thus, to motivate someone, one needs to understand what level of hierarchy the other person actually is and then focus on satisfying the need of that level or higher. Maslow divided the five needs into higher and lower orders. Physiological and safety needs were classified as Lower-order needs and social, esteem and self-actualization as Higher-order needs. The difference between the needs is that Lower-order needs are satisfied externally by things such as pay, union contracts and tenure whereas Higher-order needs are satisfied internally that is within a person. Clayton Alderfer reworked this theory and named it ERG theory meaning Existence, Relatedness and Growth. The only major difference between this to theories was that, Clayton Alderfer did not assume the presence of the hierarchy and assumed that a person could be

concentrating on all three attributes simultaneously as shown in figure 1.

**2.2 Justification**

Fierce competition has been one of the factors of employee’s committing an unethical behavior. For a manager, his/her salary is based on the performance of the business and competition prevents him from actually achieving what he expects to receive as a salary and this leads to them seeking personal incentive for providing their company services and corruption in general which is unethical. The theory basically tells us that, ‘an unsatisfied need leads to motivation to fulfill that particular need’. Therefore, an employee commits an unethical behavior because something motivates him to do so and motivation arises from an unsatisfied need. Thus, an employee commits an unethical behavior because he/she has to satisfy a need that has previously been unsatisfied. So someone needing more wealth because he/she is not satisfied with their current will be tempted to commit an unethical behavior to gain more. One would argue that everyone is not satisfied with what they have but everyone does not commit unethical behaviors. This is justified by the fact how an individual is brought up. The values and morals in his life will decide whether he/she will actually commit the behavior or not but it must be said that motivation is still eminent.



Figure 1 Abraham Maslow’s Hierarchy of Needs

**3 What is an Ethical Behavior and What Is an Unethical Behavior?**

**3.1 Theory**

Members of organizations throughout the world are finding themselves facing ethical dilemmas that are, situations in which they are required to define right and wrong conduct. What actually constitutes good ethical behavior has never been clearly defined and in recent years, the line differentiating right and wrong has become even thinner. Is it any wonder that employees are expressing decreased confidence and trust in management and that they are increasingly uncertain as to what constitutes appropriate ethical behavior in their organizations? Organizations and managers are responding to this problem in a number of ways. For instance, they are writing and distributing codes of ethics to guide employees through ethical dilemmas. They are also writing and distributing codes of ethics to shops, and other training programs to try to improve ethical behaviors. Today’s managers need to create an ethically healthy climate for his or her employees, where they can do their work productively and confront a minimal degree of ambiguity regarding what constitutes right and wrong behavior.

**3.2 Case**

Part 1: Nakama is a middle aged employee of CokePafi Comp. Ltd. He stole a \$100,000 from his company. The Managing Director of the company fired him as soon as the company found out and turned him over to the Police. Nakama pleaded guilty and was imprisoned for 10 years.

Part 2: Nakama had an only son aged 12 who was diagnosed with brain tumor. He had spent all his money in the treatment for his son. He needed a \$100,000 for the operation of the tumor after which his son would be cured if the operation was successful. He could not ask for a loan because he had no properties. The only option he had was to steal the amount from the company. He knew it was wrong but in his situation, that was to save his son, it was the right choice. He told press after his sentence that what he did was wrong but for him, in that particular circumstance, it was the right decision. His son’s

operation was successful and lived a healthy life waiting for his savior and God in disguise.

### **3.3 Justification**

“Everyone in the world are right, the only thing wrong is the time”. The above statement means that to every issue and conflict, both parties are right or correct but the reason they are having a conflict is the difference of time. Difference of time in this perspective means that the way and the circumstances in which both parties think about the particular issue is different and that is why conflicts arise.

Part 1: According to the Managing Director of CokePafi Comp. Ltd, he did the right thing to fire him and turn him over to Police. Anyone in the shoes of this Managing Director would have done the same. Thus, this was an ethical/right behavior of the Managing Director.

Part 2: According to Nakama, what he did was ethical/right because of the situation in which he was in as he had no other option to save his only son. Nearly everyone in Nakama’s situation would have done the same provided they would have gone to any limits to save their son. Both the parties in this situation are right, so what is ethical and what is unethical? The answer to this million dollar question is the following statement:, “Everyone in the world are right, the only thing wrong is the time”.

## **4 Can one Ethical Behavior Supersede an Unethical Behavior?**

### **4.1 Theory**

It is a sad truth that the employees of just about every business, in every business, will occasionally encounter team members who are taking part in unethical behaviors. Such unethical behaviors include a wide variety of different activities. Among the most common unethical business behaviors of employees are making long-distance calls on business lines, duplicating software for use at home, falsifying the number of hours worked, or much more serious and illegal practices, such as embezzling money from the business, or falsifying business records. Though there is sometimes a difference between behaviors that are unethical and activities that are actually illegal, it is up to the business itself to decide how it deals with unethical behavior - legal or not. Many employees find that discovering unethical behavior among co-workers actually tests their own values and ethical behaviors. After all, unethical behavior that is not illegal frequently falls in a grey area between right and wrong that make it difficult to decide what to do when it is encountered. Furthermore, different people have different views regarding what is ethical and what is unethical. For example, some people feel that it is alright to tell a little "white lie", or to make one long distance call on the company's nickel, as long as they can justify it in their mind. When employees discover other employees doing something that they know is wrong by the company's standards, their own sense of what is right and what is wrong instantly comes into question. That employee needs to consider how s/he feels about that particular activity, as well as informing about that activity, or turning a blind eye. Even by deciding to do something about it, the employee who has discovered the unethical behavior is presented with a number of difficult choices. Should the employee speak to the individual directly, or should the employee head directly to a company supervisor? To make this decision a bit easier, many companies have adopted several techniques that allow for the management of unethical activities. The first step is to create a company policy, in writing, that is read and signed by each employee. This erases most feelings of ambiguity when it comes to deciding what to do after witnessing an unethical behavior. The second is to give a clear outline of what is expected of the person who has discovered the unethical behavior. It should include the person who should be contacted, and how to go about doing it. With clear instructions, there will be less hesitation in reporting unethical activities, and then they can be dealt with quickly and relatively easily, before they develop into overwhelming issues. Furthermore, the repercussions of unethical behaviors should be clearly stated. This way, both the person doing the activity, and the witness to the activity will be well aware of the way that things will be dealt with, and there won't be any risk of someone not reporting unethical behavior because they're afraid that the culprit will be unfairly treated.

### **4.2 Myth of Mother and Son**

There were a mother and son who used to live in a village. The son was very arrogant, disrespectful and outlaw. He usually talked back to his Mother, was involved in fights and even stole as a result of peer pressure. One day, his mother told him that she is going to hammer a nail in the wall for every wrong that he would do and she would not remove the nail unless he does a good deed. This had no influence on the son and he continued in his usual wrong behaviors. After a year, when he looked at the wall of his house, it was filled with nails and at that moment it clicked to him of how many wrongs he had done, how many people he had hurt and how many hearts he had broken. From that very day, he decided to do all good things and to part with his old life. He started to change into a good person as

time went by and as a result of his good deeds; his mother removed the nails one by one. After more than a year, all nails were finally removed. After the nails were removed, the son told his mother that he had become a good person. So his mother told him that even though all the nails had been removed, the marks made by those nails will always remain because no matter how many good behaviors we do, our bad deeds will always be remembered.

#### **4.3 Justification**

The moral of this story is that, one unethical behavior cannot supersede an unethical behavior. Actually, no matter how many ethical things we do, our unethical behavior, even if it is just one, will always remain. Thus, concluding that one ethical behavior cannot supersede an unethical behavior.

## **5 Is there a Relationship between Stereotyping and Unethical Behavior?**

### **5.1 Theory**

Stereotyping is when we judge someone on the basis of our perception of the group to which he or she belongs. We rely on generalization everyday because they help us make decisions quickly. They are a means of simplifying a complex world. It's less difficult to deal with an unmanageable number of stimuli if we use heuristics or stereotypes. In organizations, we frequently hear comments that represent stereotypes based on gender, age, race, religion, ethnicity and even weight. Stereotypes can be so deeply ingrained and powerful that they influence life-and-death decisions. One study has shown that, controlling for a wide array of factors (such as aggravating or mitigating circumstances), the degree to which black defendants in murder trials looked stereotypically black essentially doubled their odds of receiving a death sentence if convicted. One specific manifestation of stereotypes is profiling—a form of stereotyping in which a group of individuals is singled out, typically on the basis of race or ethnicity, for intensive inquiry, scrutiny or investigation. Since 9/11, ethnic profiling has become the subject of much debate. On one side, proponents argue that profiling people of Arab descent is necessary in order to prevent terrorism. After all, a good percentage of the large-scale terrorist attacks that have taken place over the past 30 years have been perpetrated by Muslim terrorists. On the other side, critics argue profiling is demeaning, discriminatory and an ineffective way to find potential terrorists and that Muslim Americans are as law abiding as other citizens. The debate is important and implies the need to balance the rights of individuals against the greater good of society. Organizations need to sensitize employees and managers to the damage that profiling can create. Many are expanding their diversity training programs in order to particularly address ethnic stereotyping and profiling. One of the problems of stereotypes is that they are widespread and often useful generalizations, despite the fact that they may not contain a shred of truth when applied to a particular person or situation. So we constantly have to check ourselves to make sure we're not unfairly or inaccurately applying a stereotype in our evaluations and decisions. Stereotypes are an example of the warning, "The more useful it is the more danger from misuse."

### **5.2 Attribution Theory**

This theory tends to generally explain the way in which one judges another person. This theory explains the ways in which we judge people differently, depending on the meaning we attribute to a given behavior. It suggests that when we observe an individual's behavior, we attempt to determine whether it was internally or externally caused. That determination however, depends largely on three factors:

- (a) Distinctiveness (b) Consensus (c) Consistency

First, let's clarify the differences between internal and external causation and then we'll elaborate on each of the three determining factors. Internally caused behaviors are those we believe to be under the personal control of the individual. Externally caused behavior is what we imagine the situation forced the individual to do. Distinctiveness refers to whether an individual displays different behaviors in different situations. If everyone who faces a similar situation responds in the same way, we can say the behavior shows consensus. Consistency is when a person responds to the same situation in the same way over time.

### **5.3 Story**

During the Bombay riots in India between Hindus and Muslims, a Muslim mother illustrated to her son (Khan) who was hearing all the bad deeds of Hindus and was growing hatred for them, she drew a man holding a stick and giving it to him (Khan) and then she drew another man giving a lollipop to him (Khan). The mother then asked her son (Khan), which one of these two men was a Hindu and which one was a Muslim. Khan said that the man giving the lollipop to him was a good man and the man trying to

hit him with a stick was a bad man and he said that he could not say who of these two men was a Muslim and which one was an Indian. So the mother told him that this is the fact of the world, that there is no difference between people, the only difference is that there are good people and there are bad people and that there is no other difference.

#### **5.4 Justification**

There has been increasing number of situations where both you and I have a particular person by their race, color, religion or looks or even been at the end of the same treatment. As this is human nature, values actually teach us the opposite. This small story changed the life of a person and turned him into a person who can change the world. The bible says that “we were all created in the image of God and God was neither white nor black”. Parents, teachers, elders and anyone with influence should preach these words as the first step towards world peace and lay to rest any differences that prevent us from doing so. Many people must have seen this movie but only a few would have actually practiced what it taught them. Thus, there is no relationship between stereotyping and unethical behavior. If we see a Muslim person, it does not mean he or she is a suicide bomber. To think that someone who belongs to a particular group will actually do an unethical behavior is baseless. Therefore, the quicker we accept that there are only good and bad people and that there is no other difference between human beings, the quicker, a village, a town, a city, a country and our whole world can move forward bringing peace and prosperity to make our own Heaven on Earth.

#### **6 Conclusion**

As countries grow richer, their perceptions on what is ethical, changes. This paper has been written in order to convey that ethical and unethical behaviors run on very thin lines and that what is important is to instill values and norms in a person from their childhood as it is the only way one can choose between right and wrong, ethical and unethical. Accordingly, most of the justifications made in this paper are from Values theory and it is not something one can read and understand, but it is something that comes with time and being wise and it is all contained in one word, “Wisdom”

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# The Cause and Prevention of Major Risks for Securities Company: Taking Hantang Securities as the Case

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**Abstract:** The hidden risk of the securities is dangerous for the securities companies. This paper will describe how the hidden risk affect the securities companies and we will analyze questions about the securities companies which come into our mind: what's their major risks, what's the reason of their irregularities leading to the huge risks, what's the action of the securities regulatory authorities, how to prevent these risks and what's revealed from the risk outbreak. With Hantang Securities as the case, this paper will give some suggests to solve the above questions.

**Key words:** Securities companies; Risk; Risk prevention; Capital problems

## 1 Introduction

Since the year of 1981 when 4.866 billion five-year state bond was issued to the enterprises and institutions, China securities industry has covered a history of over 25 years. From September 1985 when the new China's first securities company came into birth in Shenzhen the special economic zone, to the end of 2005, 116 companies had been set up. In the glooming market of recent years, the securities companies, with mistakes in choosing proper profit model as well as in risk management, failed to play the role as a medium, leading to prevailing loss in securities industry. In the subsequent remediation, some companies were cleared out of the market and meanwhile some successful ones were pushed onto the stage front.

The year of 2004 is when the hidden risks of the securities erupted in full scale. Over twenty companies with irregularities in the business operation, encounter the problem of capital china fracture, which brings great loss for the investor as well as instability in the financial market.

In developing the securities market, the irregularities of a few companies had been covered until the full scale outbreak in 2004. A group companies such as South Securities, Zhongfu Securities, Deheng Securities, Hantang Securies, etc. were stuck into business scandals due to the long-term risks.

Take Hantang Securities case for analysis.

Hantang Securities Co., Ltd (Hantang securities hereinafter), under the approval from China Securities Regulatory Commission, was established by combining Guizhou Securities and Zhanjiang Securities. In December 2001, it was listed in Shenzhen, with excellent performances in each business sector. It was ranked 32nd in 2002 up to 16th in 2003 in the annual securities company list.

## 2 Risk Outbreak of Hantang Securities

With the sequent falls of securities companies in 2004, the market sank in deep mire. Irregularities such as collateral misappropriation, state bond repurchase, etc. were risked for capitals which were used as proprietary trading leading to huge loss and broken capital chains finally. In this context, the clients of Hantang Securities demanded advanced refunds. The increasing refund demands, especially the 800 million refund in Shanghai on August 16th 2004, triggered the risk outbreak. Next day Hantang Securities was informed the capital chain fracture. At the same time, Wu Keling, the legal person of Hantang Securities, reported this crisis to Shenzhen Securities Regulatory Bureau. Subsequently, its assets were frozen after the investigation. On September 3rd 2004, it was announced that due to serious irregularities, Hantang Securities was taken over the custody to protect the legitimate rights of investors.

## 3 Major Problems and risks of Hantang Securities

### 3.1 Misappropriate client's clearing fund

Clearing fund is the deposit trusted in the securities company for securities trading by the client. It has been an open secret in China's securities market to appropriate client clearing fund by the companies, which is obviously forbidden by the related authorities and laws. Yet it is in vain without an effective supervisory mechanism. The audit result revealed that the client clearing fund appropriated by Hantang Securities amounted to the stunning 2.456 billion.

### 3.2 Trust management against regulations



Trust management refers to the trustee trusting his proprietorship or financial assets to the securities company for investment management and value growth. Nevertheless, the securities company is released from the liabilities of guaranteed investments.

In the real operation, Hantang Securities manipulated the whole trust managements against the regulations, turning them into high-yield savings essentially.

### **3.3 State bond repurchase against regulations**

State bond repurchase is to mortgage the state bond for capitals. So far, state bond repurchase is operated in exchanges and banks with different trading rules and risk management mechanism respectively. It is against the regulations by the securities companies to appropriate the client's state bond for repurchase.

State bond repurchase against regulations by Hantang Securities had pushed itself into capital crisis before the risk outbreak. It was revealed that the face value of state bond appropriated by Hantang Securities amounted to 1.338 billion.

### **3.4 Proprietary trading against the law**

It is allowed by China Securities Law to operate the self-managed securities business by securities companies. Proprietary trading gives the securities company freedom of participating in trading activities by managing the capital or securities independently. This business, taking small share in foreign securities counterparts, is high-yield yet full of risks.

It is stated in the law that any securities company in simultaneous operations of securities brokerage business and proprietary trading that fails to handle the businesses separately according to law and conduct mixed operations shall be ordered to make a rectification and confiscated of the illegal income; where there are serious circumstances, it shall be revoked of the securities businesses originally verified and determined by the securities supervision and administration institution. Too much proprietary trading results in such irregularities as clients' margins appropriation, state bond repurchase, ect. to cover losses from self- managed securities business.

Without a full consideration on financing and its own risk tolerance, Hantang Securities was finally liquidized because of its illegitimate financing for proprietary trading which results in huge loss. With only 901 million registered capital, Hantang Securities invested as much as 4.680 billion on proprietary trading, most of which was financed from irregular business operations. Once risks break out, Hantang Securities is unable to cover the capital gap leading to capital chain fracture eventually, so the serious problems appers.

## **4 The Reason for Risks**

### **4.1 Problems root in the company structure and management**

As a company with limited liability, Hantang Securities was held by twenty companies among which Hainan Runda was the first shareholder, taking up 19.97% in shares. Most of the shareholders, though, remained as nominal without real investments. Hantang Securities, controlled by Hainan Runda, was unable to build a balanced separated power structure among the shareholders, the board, and the supervisory committee.

### **4.2 Illegitimate financing and earning**

The single and illegitimate profit model results in irregular business operations that lead to business crisis.

## **5 Measures and Suggestions about Risk Prevention**

### **5.1 Precaution against appropriating client clearing fund**

It is suggested to manage client clearing fund by the independent third party.

### **5.2 Precaution against illegitimate trust management**

The securities company is suggested to finance from widening channels.

### **5.3 Precaution against illegitimate state bond repurchase**

In order to resolve risks out of state bond repurchase, the following changes on trading regulations are suggested:

#### **5.3.1 Change on trust account**

It is suggested to turn the secondary trust into trust account, and the seats coalition into account settlement, preventing the shortage in mechanism. Meanwhile, to comply with the related regulations and laws, securities companies are not allowed in state bond repurchase.

#### **5.3.2 Lower the mortgage ratio in state bond repurchase**

A lower mortgage in state bond repurchase is to increase financing investment, avoiding the risk out of mortgage shortage.

#### 5.3.3 Widen the financing channels

In long-term, it is the widened financing channels and diversified investment that resolves the problem from state bond repurchase. With a mature lending market, the qualified securities company is equally treated like the bank in borrowing and lending.

### 5.4 Precaution against risks out of proprietary trading

#### 5.4.1 Policy on self-managed investment

At the growing stage China's securities market runs at stake. With fragile risk management, the securities companies shall be cautious on self-managed investment policy.

#### 5.4.2 Management on self-managed financing

It is stated in the securities law that the self-managed business of securities companies shall use the capitals of their own or from legitimate financing. The legitimacy of the capitals reduces not only irregularity possibilities but also financial risks when self-managed business is at low ebb. The securities company shall apply strictly to the authorized approval, and follow closely the approval process.

#### 5.4.3 Control on the self-managed business process

To avoid risks, capital or shareholder account opening shall approved by the legitimate process. The shareholder account in self-managed business shall be under unified administration by another party. Restrictions shall be put on the operating personnel and operating permission, especially on the security of operating confidence. The operating permission on the capital flow-out businesses shall follow the approval process strictly. Separate the unrelated business operations.

#### 5.4.4 Control on accounting

The files and approval procedures of accounts opening, closing, and trusting shall be recorded in the accounting department. The accounts under financial accounting shall be approved by the superior management. To avoid disagreements, the documents issued by the operation office shall be stamped under its seal. Platform shall be built by the self-managed business departments to check regularly the balances with accounting departments and operation offices. With or without business operations, the statements from operating offices shall be checked. Provisions shall be withdrawn when self-managed businesses make profits.

#### 5.4.5 Policies implementation

Policies do not mean risk precautions. Without strict implementation, even perfect policies will go in vain. A lot of cases demonstrate that risks break out of various operations against policies. It is the implementation that matters.

#### 5.4.6 Focus on people to control risks

With risk consciousness, the securities companies depend on their employees to implement policies in self-managed businesses. No matter the deliberate crime, or the professional incapability, or work mistakes will lead to risks. A people oriented risk controlling lies in two points: firstly give importance to virtue examination in choosing and appointing the personnel in self-managed business. Secondly strengthen the risk awareness from the regular employee to the leaders.

## 6 Conclusion

Based on the case of Hantang Securities, this paper describes the major risks of securities companies: 1. Misappropriating client's clearing fund, 2. Trust management against regulations, 3. State bond repurchase against regulations, 4. Proprietary trading against the law. Thorough the analysis of these risks, we can find the reasons: Illegitimate company management structure and financing and earning model. So we give some suggestions to solve these problems. The hidden risks of the securities companies can't be completely eradicated, but we can take measures to reduce the risk rate through the further study on them.

Hantang Securities case is an important one on securities brokers risk disposal in our country. In this case, we can learn much experience about securities brokers risk disposal, such as the independent customer deposits save tube as the third party, the independent regulatory approval in asset management business, self-support business regulatory, independent trusteeship of the national debt, and so on. The successful experience has been rules and regulations in securities brokerage industry, and this case improved the securities brokerage industry greatly.

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# Modeling and Simulation of Product Service Systems for Design and Innovation\*

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**Abstract:** This paper addresses the process of designing new product service systems (PSS). The product service systems mean wide range of businesses which include physical products and intangible services such as software. For design and innovation, this paper proposes a modeling and simulation methodology of a system of a hardware and software. The process to promoting new PSS contains five steps. First step is to have a creative mind so that designer himself surely can start an innovation. Second step is to find good PSS idea. Third step is to select and choose the best idea. Forth step is to describe clear blueprint and to visualize the architecture of PSS. The clear blueprint helps to evaluate the technical and economical possibilities. Last step is to realize the PSS idea into this world by managing teams and projects. Based on a modeling method of hardware-software-systems based on SysML (System Modeling Language), a blueprinting methodology is proposed and confirmed by describing electric power supplying business.

**Key Words:** Product service systems (PSS); System modeling language (SysML); Creative design

## 1 Introduction

This paper discusses how to realize new product service systems (PSS). The product service systems includes wide range of businesses such as airline, automobile, hotel, travel agency, electrical energy supplying system, and so on. Launching new product service systems is one of the most important and really desired activities in this world.

New PSS creates not only new customer, new satisfaction, but also new employee, new social value, and even if new technology, new academia, and new future. How difficult the designing new PSS is well known especially for young students and young business person. On the other hand, we can recognize that in this world has some excellent PSS creator such as Steve Jobs<sup>[1]</sup>. For example, Konosuke Matsushita, who is a founder of Panasonic Corp, created more than thousands of companies which manufacture electric products and provide services<sup>[2]</sup>. What is the difference of normal PSS designer and such excellent PSS creator? This paper assumed that there should be key issues for creating new PSS business.

Some people create a lot of companies, new business, and new product-service-systems. There are many people who do not create any company even if he has excellent abilities and is excellent as an employee. What is the difference between just an employee (even if he is quite excellent) and such innovative designer of product-service-systems?

## 2 Process of Designing New Product-Service-Systems

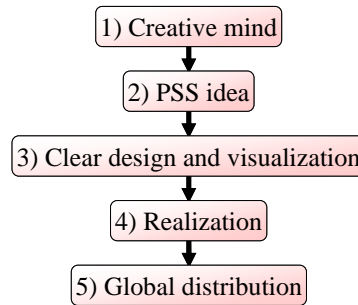
This paper focuses on the difference between innovative promoter of new creative product-service-systems and normal people. An important assumption is that the difference never comes from how much money they have. In other word, this paper ignores the difference from parents, assets, academic record, nationality, regions, and genders, because the historical great innovator did not always have them.

This paper proposes the process of promoting new product-service-systems as figure 1.

There are two different kinds of product-service-systems. First is creative PSS such as airline service, bike rental system, internet service, mobile phone, and auto mobility services. Creative PSS provide new customer satisfaction to increase social happiness. Second is not creative PSS such as short selling attack, financial alchemy, reckless derivative (such as subprime loan), gambles in stocks, and zero-sum money game. These PSS do not create new value itself. Not creative PSS compete for the created value by creative PSS with each other.

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**Figure 1 Process for Realization of New Product-Service-Systems**

**Creative business**

= create new customer satisfaction and happy society  
 (Examples: airline service, bike rental system, internet service, mobile phone, and auto mobility services, etc. )

**Not creative business**

= compete for created value by creative PSS  
 (Examples: zero-sum money game, reckless derivative (such as subprime loan), gambles in stocks, selling short of hedge fund, etc.)

**2.1 Step1: Having creative mind**

First step is to have creative mind. The creative mind means that you believe that you can achieve an innovation. The first step of having creative mind is decomposed into three steps as shown in Figure 2.



**Figure 2 Step 1: Having Creative Mind**

There are two different kinds of minds. One of them is a competitive mind. The other is creative mind. The creative mind precedes everything.

- 1) Competitive mind
- 2) Creative (Collaborative) mind

Today’s school teachers teach mainly based on competitive mind. In junior school, high school, and sometime even in the university; students are forced to compete with the other students. Beating other person is often a reason of getting his personal high score.

In order to achieve high score of product-service-systems by customer, there are no personal score. Always customer evaluates the performance of the PSS providing team. Hence, creative product-service-systems require highly collaborative team. The creative idea requires collaboration, wide vision, and throughout improvement. The creative mind focuses on collaboration and creation of

new value. Hence, changing from competitive mind to creative mind is very important first process.

In order to keep creative, at first we are going to have to forget the passive mind. Most of people pretend like they are victim. Joblessness, economic slowdown, bad recession, credit crunch such as Leman’s shock, disaster of an earthquake, are sometime frequent excuse of the passive victim’s mind. First important step to be a creative is to forget the bad uncontrollable issues, and change the passive mind to an influencing mind.

Next important step to have a creative mind is to find enjoyment in a designing and creating activities. It is necessary to believe that you yourself can create some valuable product or services, and change the world.

The final goal never should be a meaningless goal or nothing but a zero-sum money game. The final goal should be a valuable goal for both of yourself and society. All effort toward meaningless goal is also meaningless. Automatic algorithm for wining zero-sum money game or technique for imitating product is one of the examples of the meaningless goal. Only worthwhile, happy-related, through-life valuable goal derives great inherent creativity in human kind.

**2.2. Step2: Finding business ideas**

After first step, the creative mind was installed. Next we have to find good ideas of product-service-systems.

Finding new PSS idea is the most creative and interesting work. Almost all business people like to do it. The number of ideas is infinite. In our society, we can find infinite number of ideas. The PSS idea can be found in every area, every field, every hierarchy, every firm, and every customer. Because all needs, troubles, and ideal gaps can be ideas. Almost all people can stand to searching good idea in 24 hour a day, every day.

For finding new PSS idea, there is no one way, but if this paper propose how to find the PSS idea, steps 2-1) to 2-3) in figure 3 might contribute.

1) reconsider an ideal as they should be (to-be )

Observing products and services in real world, and reconsider an ideal per se.

For example:

a) should automobile burn fossil oil?

b) should we always carry all of a mobile-phone, a lap-top PC, a digital-camera, and an IC recorder?

2) find gap between 'As-Is' and 'To-Be'

Next step is to find the gap by comparing between 'To-Be' world and the 'As-Is' world. From the gap, we can find many ideas.

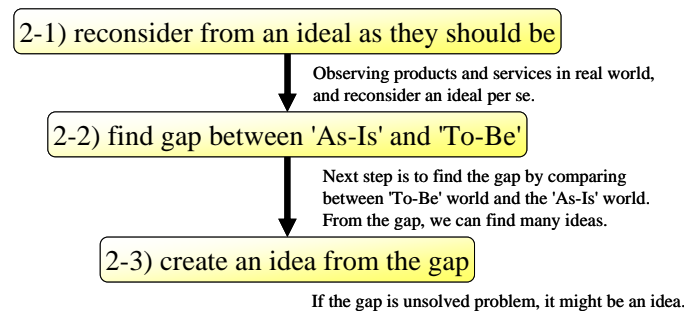
3) create an idea from the gap

If the gap is unsolved problem, it might be an idea.

For example, from 'To-Be' 1.1)-1.2):

a) light personal infomechatronics mobility with lithium battery

b) next generation smart phone



**Figure 3 Step 2: Finding Original Interesting Idea**

**2.3 Step3 Choosing one good idea**

When we finished listing the ideas, next task is to choose the best one. Question 'whether you need the realization of the idea from the heart or not' sometimes provides a good information for making a decision.

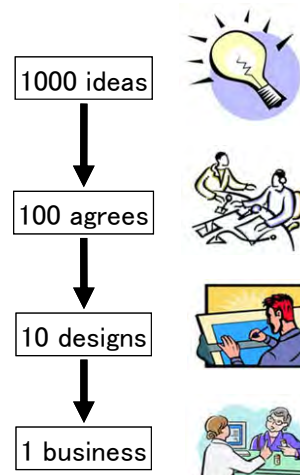
The checking must include at least following three aspects:

1) timing,

- 2) possibility, and
- 3) impact.

In order to evaluate the validity of the idea, the discussion with specialists who comes from different domain about whether we can collaborate to realize the idea can provide a good indication.

Negative feedbacks from the specialists mean that the idea cannot over the financial / technical / team issues.



**Figure 4 Choosing What Is Good and Leaving What Is Bad**

The ideas which passed the validation by the specialists are the candidates of the realization. In this step, speed of creating ideas and the number of evaluation is very important. There is one question, how much this evaluation process is going to cost? The answer is, almost zero. Rapid creation and evaluation process derives better ideas.

Figure 4 shows an example of the ratio. 100 ideas is agreed from evaluating 1000 ideas (or more than that). 10 ideas is decomposed into detailed design blueprint from choosing 100 agreed ideas. 1 business is survived from 10 design results.

#### **2.4 Step4 planning PSS and clear visualization**

After choosing excellent idea is the time when the idea is designed.

The purpose of the design is two:

- 1) possibility evaluation
- 2) front loading.

Before creating real product or service, the idea should be virtually designed as a model. The modeling process is also same with a thinking process. The modeling process contains processes of describing, thinking, adding, and again thinking the idea. In this step, speed is very important.

Also, concentrating to core concept and forgetting digressional topic is a key factor. Elimination of waste effort which has no relation with customer value is one of the purposes of the clear visualization.

The clear model helps to prevent a try-error process after real actual manufacturing. The clear model also helps to prevent an unwanted realization after real actual manufacturing.

The idea blueprint helps to evaluate the technical and economical possibilities. The integrated visualization and overview provides the total social acceptance as a system. The idea blueprint can also help to allocate required resources: capital, human, and time.

#### **2.5 Step5 realizing PSS in this world**

Next important task is to collect required resources for realizing product-service-systems. The required resources include engineering specialists, a banker, a funder in government, and a legislator. Our society always strongly desires next-generation excellent business plan. Because new PSS creates new employment, new value, new happiness, new activation of the industry, and improve GNP.

The clearly visualized business plan has strong power to move business persons. Serious energetic businessman always has strong curiosity for new interesting business idea. If the business plan had enough quality to convince the specialists, the specialists would be glad to help the realization. When the banker realizes the idea have a stable profit, they are glad to provide financing.

When the specialists realize the idea is challenging and technically interesting, they are glad to join

in the project. Hence, the convincing plan can collect required resources: specialists, finance, time, and even low.

These resources allow us to form a team. The team realizes the PSS plan into this world. The best and effective team has to be organized. There are three important factors: 1) the team has to share what are the purpose, and 2) enough time, and 3) enough reward. Without these three factors, even best excellent employee would not be able to realize the good PSS.

The best team is organized is the time when the PSS idea is realized in this world. The best team can produce, install, and operate the designed PSS. In this production stage, the 'improvement' idea is very important. It is very difficult to achieve perfect quality. The 'KAIZEN' mind in improving process can increase the perfectibility. The increasing perfectibility can be also done by providing the products and services to the customer.

**2.6 Global launch**

The last step is to provide the PSS into all over the world. Only local products and services are very hard to survive in this age. The systemizing approach is required.

**3 Modeling method of PSS**

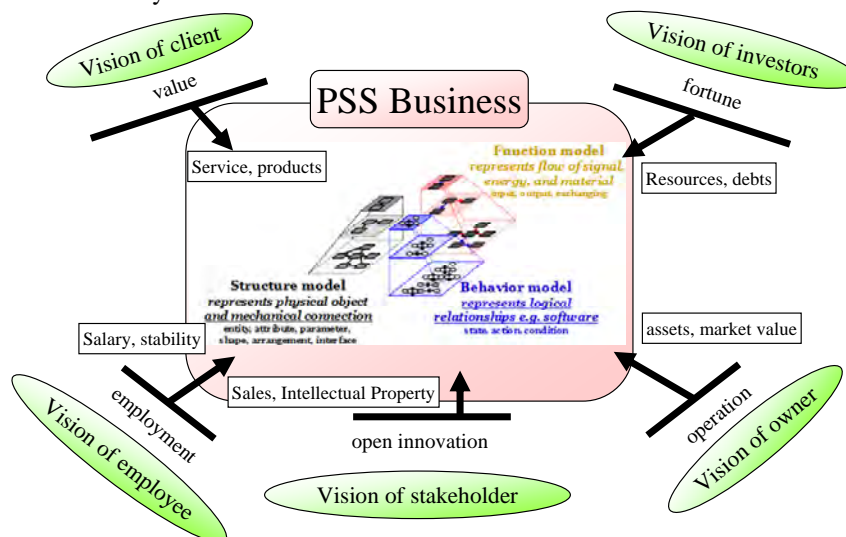
The PSS business has following five actors:

- 1) customer
- 2) employee
- 3) investor
- 4) owner, and
- 5) stakeholder.

The customer becomes happy by value provided by business. The employee becomes happy by employment provided by business. The investor is happy if the business creates fortune by business. The owner is happy when the appropriate reward comes from the business. Lastly, the stakeholder is happy when the business opportunity is brought from the business.

All actors will behave to minimize their own benefits. The benefits always conflict, because their positions are different. Hence, it is very difficult to control the business.

Figure 5 shows the modeling idea for design, blueprinting, and visualize the business based on hierarchical system modeling. This paper considers a modeling technology for mechatronics product can represent the PSS business. The PSS includes hardware systems as a product, and also includes software systems as a service. Every PSS have software and hardware.



**Figure 5 PSS Business Modeling for Design, Blueprinting, and Visualization**

Authors propose a modeling method of hardware-software systems based on SysML (System Modeling Language). Based on the modeling method of requirement [3] [4], this paper assumed that the PSS business such as hotel, traveler, and electrical energy supply business can represent the PSS business. Detailed discussion is proposed in the concurrent engineering tool [5] [6].



## 4 Design Example: Electric Power Supplying System

### 4.1 Current state and problem of electric power supply system

In 2011, redesign of the initiative electric power supply is strongly required for because of the disaster of large earthquakes in Japan and the diversification of energy resources. New national energy strategy by resources energy agency of METI represents orientation of the switch to renewable energy from non-renewable energy. Especially, renewable energy such as wind and solar has a variety of problems such as stability of supply and cost. But it tends to expand the introduction. It is required system design of the conceptual level for electric power supply such as Micro-grid.

This paper discusses an example of better system design which is intended for electric power supply system. Especially, this paper discusses system modeling method.

### 4.2 Modeling of electric power supply system

Electric power supply system is considered network which have intercross with electrical generating plant, storage equipment and consumption element through electric power transit networks. Therefore, we will define or model electrical generating plant, storage equipment and consumption element and attempt to simulation in entire network. From simulation results, we support deciding necessary capacity of equipment logically after discussing about deficiency in electrical generation capacity. In addition, we enable to estimate for cost, stability and robustness of disaster.

### 4.3 Outline of electric power supply system design approach

Figure 6 shows outline of electric power supply system design approach. The process for network design of electric power supply and demand system is process in the following. At the first, designer selects and set up element from template which is registered electrical generating plant (e.g. wind power, geothermal heat), demand element and storage element. In addition, create a correlation as electric power transit networks.

We simulated each element which is defined generating capacity and behavior and distribution of electric power between those elements in conformity with time history. So, we are able to simulate entire situation of supply and demand harboring fluctuating element. From result of this simulation, curve of supply and demand gap is led. We can calculate event such as the following from this gap. Those are enough design of electricity generated capacity, design of storage element capacity and risk of electric power shortage. From modelling functional failure as damaged network in disaster, robustness of disaster risk on the simulation base is made sure. Economical rationality which is checked in entire system is make decision from generating electricity element, storage element, set and maintenance cost of electric power cable and power loss. If we consider new set and part of improvement or elimination as business, we can estimate that it leads to benefit.

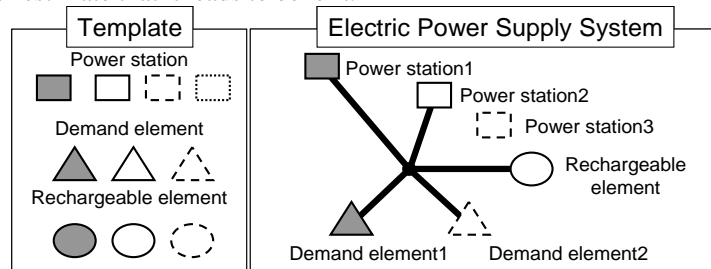


Figure 6 Concept of System Design for Electric Power Supplying System

### 4.4 Model of generating plant

Figure 7 shows depiction example of solar power plant as example of involuntariness generation plant which beyond the reasonable control of fluctuation. Solar power plant (Solar Power Plant) has production of electricity generated from installation area as attribute. Amount of solar radiation is determined by weather element (Sunny Cloudy Rainy). Day length is determined by seasonality element (Spring Summer Autumn Winter). Production of electricity is determined by amount of solar radiation and day length. Hourly amount of solar radiation is accommodated by cycle of solar irradiation. Production of electricity is determined by hourly amount of solar radiation. But, data hourly amount of solar radiation removes for sake of simplicity from model of Figure 7.

Term and percentage which can't generate electricity for periodic maintenance are shown by state transition.

Wind power and tidal power have a place as example of plant which beyond the reasonable control

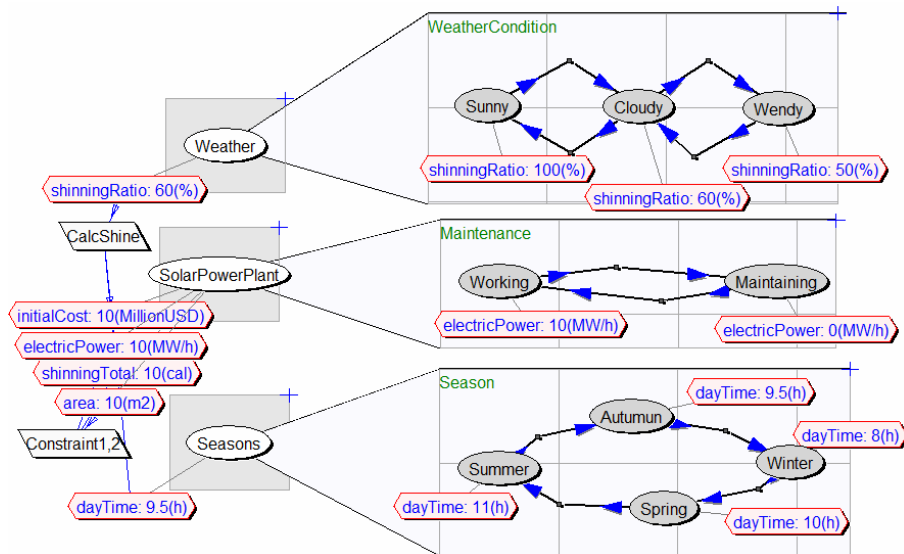
of fluctuation. Above example is shown by analogical model.

Controllable plant of fluctuation is modeled. Fluctuation element can be controlled, but is not external factor. Case in point is electric generation plant which use fire power (e.g. coal, LNG, biofuel etc).

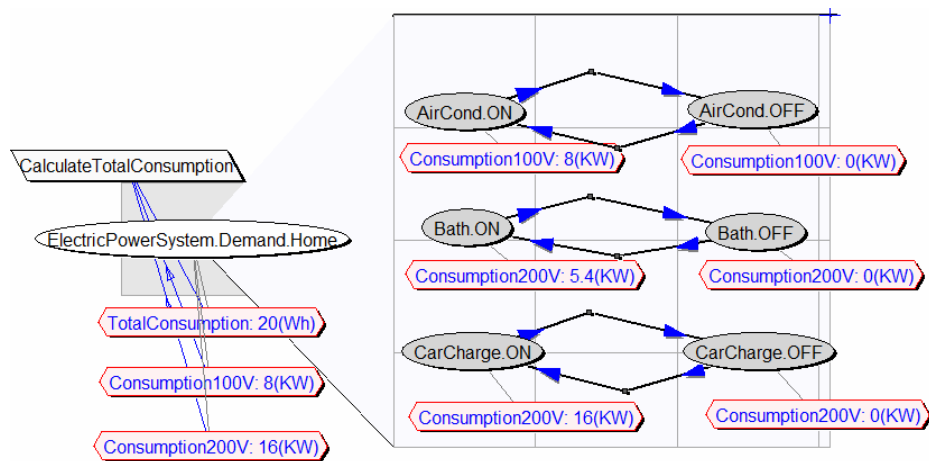
**4.5 Model of demand elements**

Figure 8 shows model description example of electrical power which be used as byword of demand elements in home. From electrification modern dwelling, most of electrical power is used by air conditioning and hot-water supply (e.g. bath). From angle of making effective use of nighttime electric power, the following is given an account. Above are laying heat in stock by nighttime water heater, using daytime hot-water, and laying electric power in stock for battery car. Entire consumed power at home is determined by the following. Above is superposition which includes consumed power at each home by probabilistic behavior.

We propose commercial installation (e.g. factory, location) and infrastructure (e.g. rail, traffic signal, street lamp) as element of demand.



**Figure 7 System Model for Uncontrollable Changing Energy Source**



**Figure 8 System Model for Consuming Element**

**4.6 Model of stock element**

Figure 9 shows model description example of secondary battery which be equipped in home as byword of stock elements. Value of model is approximate calculation of 1,000 rechargeable batteries for detached individual residence. Secondary battery is considered can cater for primary demand of discharge and charge as behavior of electrical power supply. Secondary battery start discharge when it is full charge and demand of electrical power supply exceed current supply. And secondary battery keeps discharge until definite remaining amount. If secondary battery lost remaining amount of battery charge and demand exceed supply, generating electricity make the shift to generating using controllable energy such as biofuel which is possessed stockpile.

Pumped storage generation and hydrogen storage are considered of as similar element of stock type.

**4.7 Service activities in power supply system**

The electric power supplying system consists of not only physical hardware, but also services. The service includes maintenance and operation. The proposed FBS model represents the operation/maintenance activities as service aspect. For example, the generic coal fire plant must exchange its catalyst almost once per three months. It is defined as service activities. The service activities also affect to the costing, availability, and robustness of the electric power supplying system. Hence the power supply system can be recognized as one of the PSS (Product Service Systems).

**5 Simulation Result and Discussion**

**5.1 Simulation result of generating electricity**

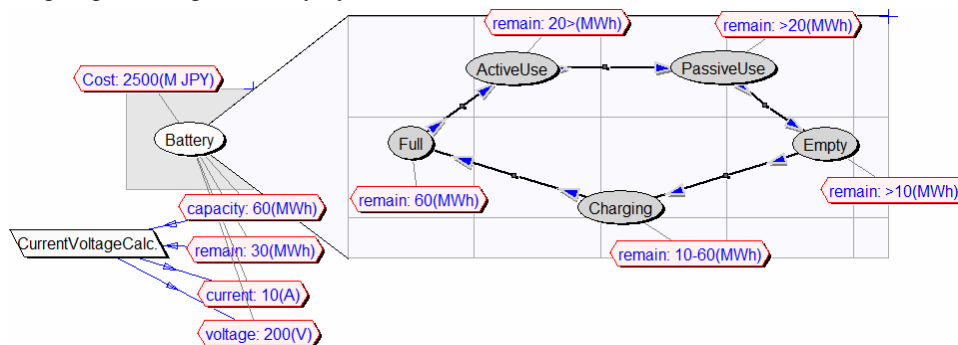
Figure 10 shows simulation result. Figure 10 shows electrical energy generated by a lot kinds of electric power plant (solar, wind, bio, geothermal heat, ocean thermal energy conversion [OTEC]) and stockpiles of secondary battery (fluctuation amount is discharge amount). Figure 10 shows information in a 24-hour period at summer days within simulation for a year. Information of all supply is all amount of electric power amount which is gotten from different energy sources.

Solar have features which generate many electric power in daytime. But solar generate low electric power in nighttime. Wind have tendency to change depending on season. Wind has behavior close to random on a day-to-day basis. OTEC and geothermal heat seem have tendency such as the following. While there are a number of efficiency changes by air temperature change, above electrical generation is keeping approximately-constant generating power.

**5.2 Comparing of supply and demand**

Curve of all demand on figure 10 shows electrical energy needs for 170,000 houses. Most of consumed power in summer day is constructed by refrigerated air conditioning. Peak of consumed power is seen 1.5 hour late than curve of insolation value. And consumed amount degrade in nighttime which debase amount of activity.

When we compare all demand and all supply, difference of both sides correspond deficiency and excess of electric power. Hatched time zone on figure 10 shows time zone of power shortages which demand is outstripping supply. Electric power network of trial design have the followings. Above are secondary battery and power-generating equipment for emergency. Secondary battery fills the role of stockpile. Power-generating equipment operates by biofuel. Electric power supply system has two-phased behavior at electricity shortage. First phase is covering shortfall by discharge of storage electric power in secondary battery. In accordance with degradation of remaining amount, second phase is switching to generating electricity by biofuel.



**Figure 9 System Model for Energy Stock**

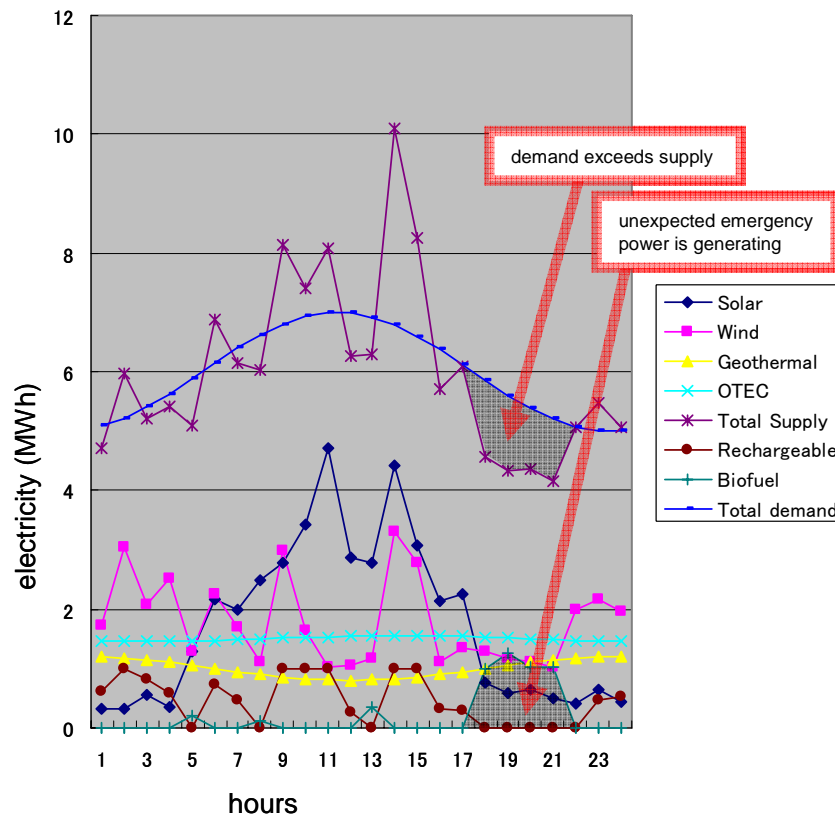


Figure 10 Comparison Between Demand and Supply Based on Simulation Result

Secondary battery storage amount is empty among 17- 21 hour by degradation of insolation amount form process of secondary battery storage amount at figure 10. Factor is deep electricity shortage by crossover between time zone which not blows wind and time zone which electrical requirements is heavy. Figure 10 shows depending on emergency generator by biofuel in the wake of running down storage of secondary battery in 1 hour.

## 6 Conclusion

This paper proposed five steps for realizing new product-service-systems. A creative mind plays fundamental role in the early step of the creation stage. In the early design stage, finding many business ideas and choosing one good idea is important. Fast creation of different ideas and quick evaluation using advices by other specialists are key drivers of the finding and choosing processes. In order to realize the PSS idea, detailed planning and clear visualization of PSS is required. The modeling technology will help the creator to describe, evaluate, improve, and visualize the PSS business idea. A modeling methodology is proposed based on author's mechatronics modeling methodology. An analogy is found in this paper - hardware and software in mechatronics systems, and physical products and intangible services in PSS.

In the future, concrete PSS systems such as energy supplying systems, hotel service, airline service, and medical service will be designed and clearly visualized using proposed creation processes and modeling method.

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# Game Analysis on Information Carrier of Risk Conduction in Venture Capital

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**Abstract:** Based on the information asymmetry, there exists dual-level principal-agent risk in venture capital, which has the characteristics of dynamic conductivity. Taking information asymmetry as the theoretical basis, the paper analyzes the principal-agent problems in venture capital action, and describes the risk conduction paths of dual-level principal-agent relationship, and constructs the risk conduction controlling model of venture capital. Also, it raises the corresponding controlling measures on risk conduction in venture capital.

**Key words:** Information asymmetry; Venture capital; Principal-agent; Risk conduction

## 1 Introduction

With the game theory and principal-agent theory applied in practice of company management, scholars in different countries began to study the principal-agent problems in venture capital from various viewpoints, and got a guiding effect on the risk control in venture capital. Akerlof put forward the Lemons Model to study the adverse selection problems under information asymmetry in 1970<sup>[1]</sup>. In 1987, Spence proposed the Job Market Signal Transmission Model to solve the adverse selection problems<sup>[2]</sup>. Yuk-sheen chan<sup>[3]</sup>, Jeffrey<sup>[4]</sup> and Dirk<sup>[5]</sup> thought that venture capitalists should take installment investment in venture capital in order to reduce asymmetric information and control the investment risk. And Salman stated establishing a reasonable compensation mechanism can solve the agency problems between the investor and venture capitalist<sup>[6]</sup>.

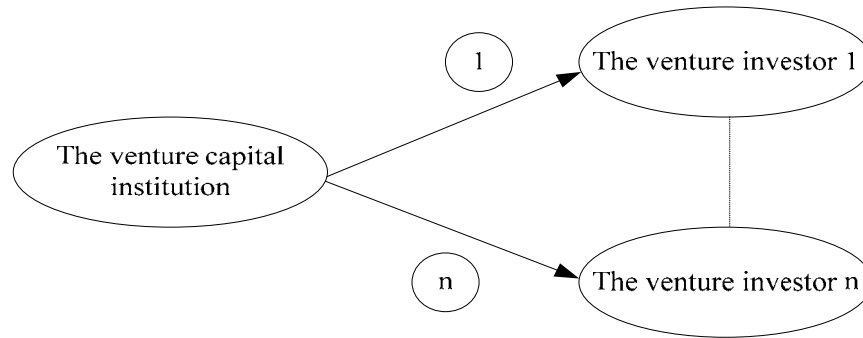
Although research on the principal-agent problems in venture capital is later than western country in China, the scholars also got some achievements. Yao Zuowen et. analyzed that venture capital institutions can use monitoring and reputation effect to solve the moral hazard problems<sup>[7]</sup>. Nan Lixin and Ni Zhengdong proposed that the main problems of principal-agent were as followings after a lot of cases: hiding information before signing contract and hiding action after signing contract, and raised the specific solutions according to these problems: responsibility investigation, investment agreement restriction, and installment investment and so on.<sup>[8]</sup>

Scholars at home and abroad only studied the principal-agent problems in venture capital from the overall viewpoint. They do not analyze the venture capital risk from the dual-level principal-agent relationship. Actually, there are dual-level principal-agent relationships in venture capital. The one exists between the venture investor and venture capital institution. Another one exists between the venture capital institution and venture enterprise. The agent knows more information about own actions, while the principal is in opposite position. That serious asymmetric information exists between the principal and agent will lead to adverse selection and moral hazard. The risk has the characteristics of dynamic conductivity. If controlling measures are not taken, it would damage the interests of the investors of venture capital. Therefore, this paper establishes the risk conduction control model of venture capital based on the game theory from the dual-level principal-agent relationship in venture capital, and raises the corresponding risk conduction control measures.

## 2 Risk Conduction Path in Venture Capital

### 2.1 Risk conduction path from venture capital institution

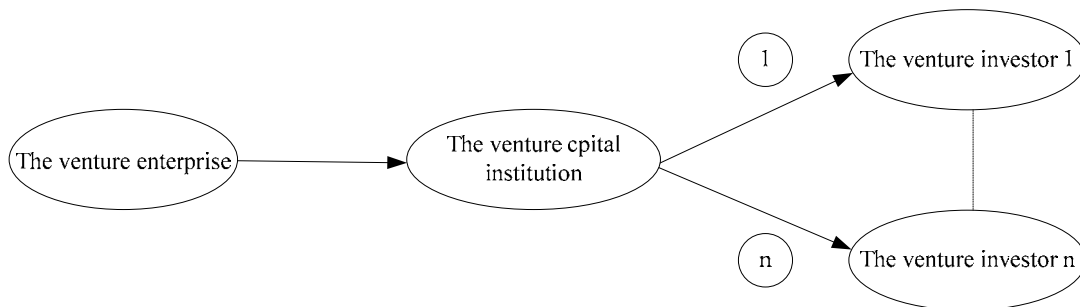
If the adverse selection problem is happened, the venture investor could choose an inferior quality institution to invest, which not only has a low profit and a poor operation condition, but also lack of the experience and ability of choosing potential venture enterprise. When the moral hazard after signing contract is happened, the institution may not fulfill its own commitment although the venture investor may choose a good institution. Then it may do harm to the interests of the inventor after raising funds, due to the principal-agent risk. The information carrier of principal-agent risk will transfer to the venture investor finally. The risk conduction path may be shown on Figure 1: the venture capital institution → the venture investor 1, or venture investor 2, ..., or venture investor n.



**Figure 1 The Risk Conduction Path From the Venture Capital Institution in Venture Capital**

**2.2 Risk conduction path from venture enterprises**

After signing contract, the venture capital institution may choose the inferior quality venture enterprise in the situation of information asymmetry. The venture enterprise may not only have possibility of high-risk, but also provide a large number of false information. The venture enterprise may do some damage to the venture capital institution for its own interests. For example, it may invest some useless project which has a little on no return at all. Under the influence of multiple factors, the moral hazard risk from the venture enterprise will conduct to the venture capital institution through the asymmetric information, then conduct to the venture investor(as shown on figure 2). The risk conduction path is: the venture enterprise → the venture capital institution → the venture investor.



**Figure 2 The Risk Conduction from the Venture Enterprise in Venture Capital**

**3 Risk Conduction Control in Venture Capital Based on Information Asymmetry**

**3.1 Risk conduction control for the 1st level principal-agent relationship**

1) Before signing contract. The venture investor can choose the ideal venture capital institution according to the signal which is send by venture capital institution by making use of A. Michael Spence’s signaling model before invest (as shown on figure 3). Through carefully choosing the financing contract from venture capital institution in the market, the venture investor can get a qualified institution if the contracts are strict, perfect and meet beneficial requirements. Then comparing every venture capitalist’s professional levels and past performance and credit rating, the investor can decide the final venture investment institution.

2) After signing contract. In order to avoid the moral risk conduction effectively, the venture investor can implement a strict supervision and the incentive mechanism which is combined with the performance to the venture capital institution (as shown on figure 3). The venture investor should use the strict supervision. For example, the venture capital institution must report the important information of company such as financial condition, the feasibility of the invested project and so on. At the same time, if the venture capital institution obtains a certain performance, the venture investor can give a corresponding reward and subsequent investment according to the level of performance.

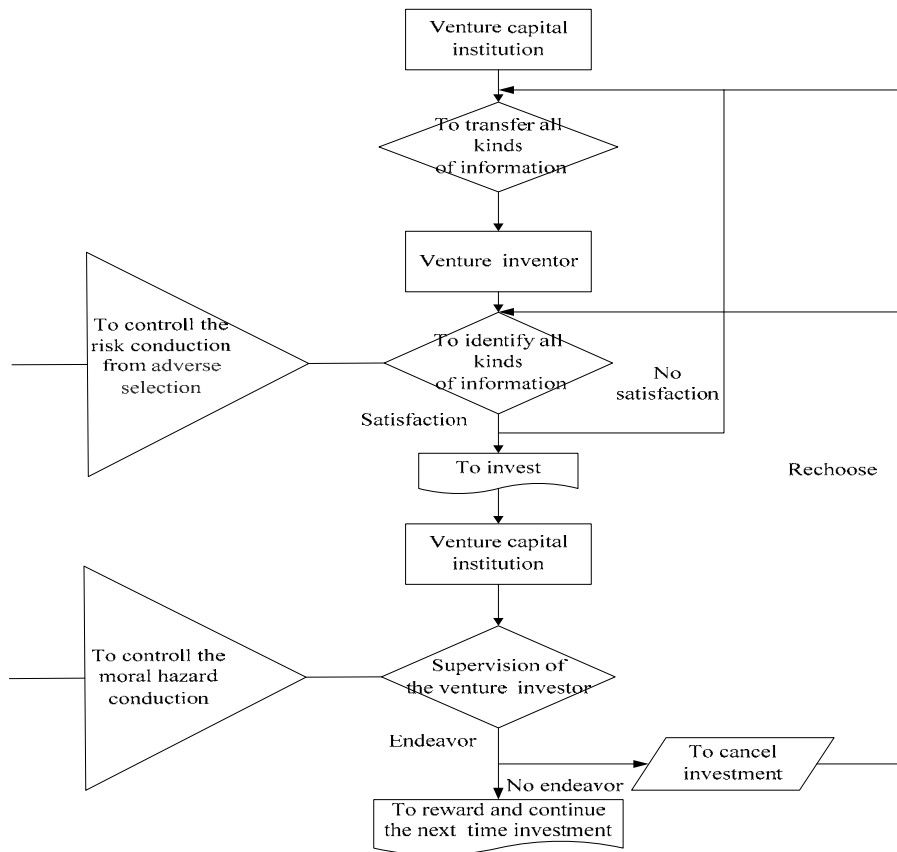


Figure 3 Risk Conduction Control Model for the 1st Level Principal-Agent

3.2 Risk conduction control for the 2nd level principal-agent relationship

1) Before signing contract. The venture capital institution should investigate about the venture enterprise and review the invested project strictly before signing contract (as shown on figure 4). First of all, the institution should know about the real financial condition to reduce the situation of information asymmetry. Secondly, it makes a sufficient investigation about the professional knowledge, skill, ability and the cooperation condition of the team of the venture firm. Also, it can do a strict review about the invested project which the venture enterprise applies, and ask the enterprise providing a detailed project application. After these measures, the institution decide weather invest the venture firm or not to avoid the adverse selection risk.

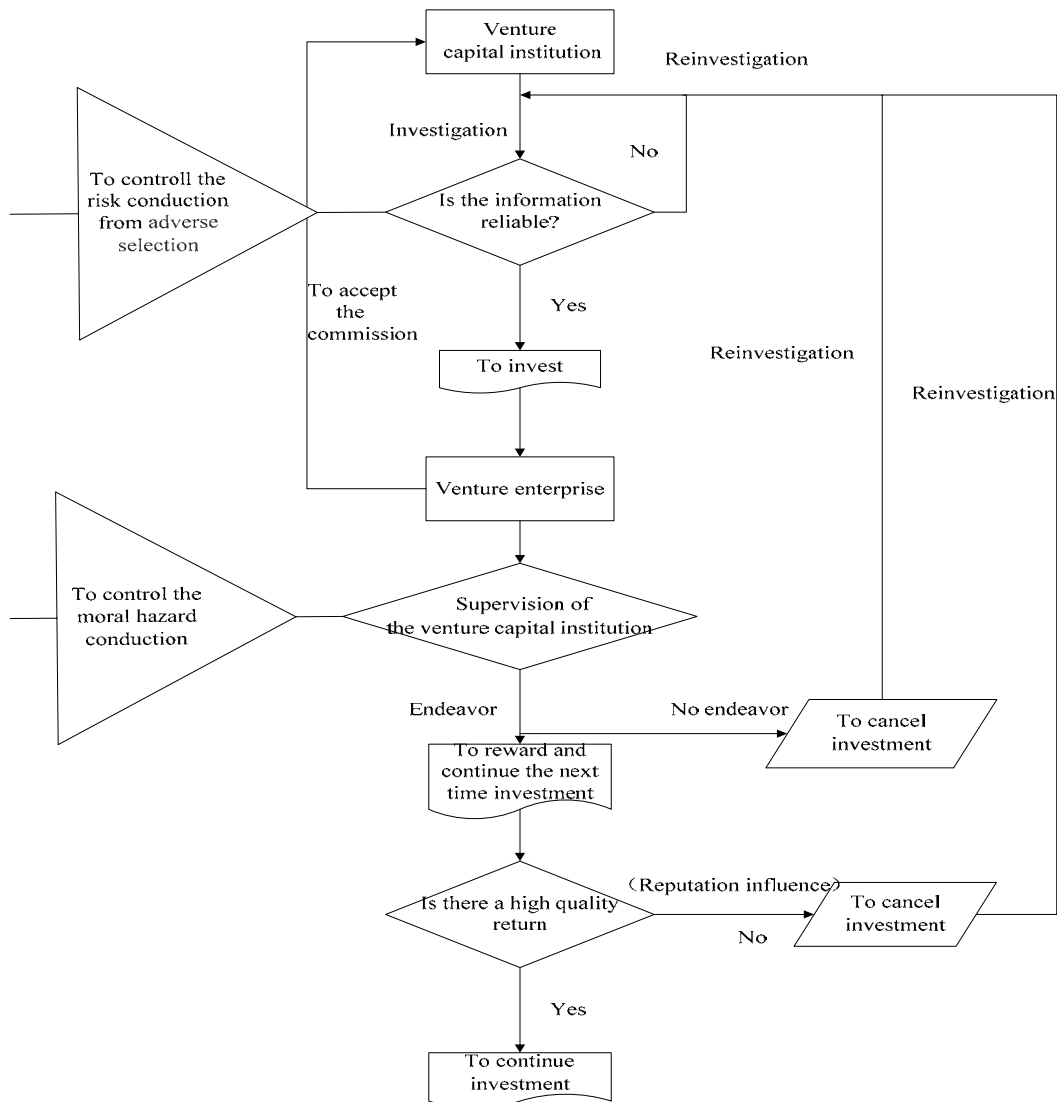
2) After signing contract. The venture capital institution should implement a strict supervision and the incentive mechanism to prevent the risk conduction. From Table 1, we can make a conclusion: if the venture enterprise chooses “endeavor”, the cost of endeavor is C. The venture capital institution can get V as earnings, and pay A as its cost. On the contrary, if the venture enterprise chooses “no endeavor”, the cost of “no endeavor” is C’. The venture capital institution can get V’ as earnings, and pay B as a lower cost.

Table 1 The Game Between the Venture Capital Institution and Enterprise

Action	Earnings	The venture capital institution	The venture enterprise
	The venture enterprise : endeavor	V - A	A - C
The venture enterprise: no endeavor	V' - B	B - C'	

In the game, the venture capital institution can control risk conduction if  $A - C > B - C'$ , and realize a win-win result. The reward given by the venture capital institution is higher than the loss that the venture enterprise does not work hard in the mechanism of supervision and incentive, the venture enterprise will work hard.





**Figure 4 Conduction Control Model for the 2nd Level Principal-Agent Risk**

In the meantime, the venture capital institution can use the market effect to constraint the reputation of the venture enterprise. The reputation model of Kreps, D, Milgrom P, Roberts J and Wilson R <sup>[10]</sup> proves that the incomplete information plays an important role on equilibrium results. The cooperation behavior will appear in the limited repeated game<sup>[11]</sup>. Therefore, the venture capital institution can make full use of implements supervision, because it can take advantage of the pressure from the market environment. After the first time investment, the venture capital institution can get an imagine about the ability and performance of the venture enterprise. And it can decide whether re-invest or not in the next time investment. In order to get more capitals and have a good reputation, the venture enterprise must work hard. The reputation influence will not only bring the effective benefit, but also prevent the moral risk conduction effectively.

#### 4 Conclusion

Based on the information asymmetry theory, research on risk conduction in venture capital is a new field in the venture capital management. It has a practical significance in the venture capital management. In the basis of domestic and foreign literature reviews, through the game analysis from the dual-level principal-agent risk in venture capital, this paper designs the risk conduction path and puts forward the relevant risk conduction control measures. It aims to help the principal reducing the unnecessary losses in venture capital contract. However, the main limitation of this paper is: to study the risk conduction control of the principal-agent relationship in the venture capital behavior only from the

principal angle. In fact, the venture capital behavior presents systematic complexity. The risk conduction paths are not only unidirectional, but also bi-directional and complex direction. It expects to process further research comprehensively and provides the better advices for the party of interest in venture capital.

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# Property Right Innovation and Risk Control for China's Private Capital Accessing the Insurance Industry

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**Abstract:** Since the reform and opening up, China's private capital has been increasingly flocking into the insurance industry, the combination between industry and finance has been emerged. While promoting the industrial property right reform, corporate governance mechanism, and market competition structure, China's private capital also can bring about some potential risks such as corporate governance risk, related transaction risk and solvency risk while accessing the insurance industry. With the aid of modern property right theory, this article summaries the property right innovation and corporate governance improvement achieved by China's private capital entering the insurance industry, analyses the potential risks, and at the end, suggestions are provided for risk control for China's regulation department.

**Key words:** Property right theory; Property right innovation; Risk control; Private capital; Insurance industry

## 1 Introduction

Property right is a fundamental concept in the economics and finance literature. Property right provides firms with the right to own assets, to benefit from the income generated from those assets, to dispose of the assets, and to seek compensation for any damages to such assets caused by third parties. Modern property right theory holds that, the operation of economic system depends on the distinct definition of property rights. An accurately defined and stable property right contributes to the protection of freedom, but also to a room for economic activities of higher class, finally conducive to the development of modern market economy; on the other hand, a society deficient of property right or with undefined property right, while, would be comparatively low in efficiency and absolutely ineffective in resource allocation. Recent studies also show that defined property right will enhance corporate governance, corporate innovation, corporate risk control, firm growth and thereby economic growth (e.g., Adams et al., 2011; Chen Lin et al., 2012).

Since the reform and opening up, China's private capital has been increasingly flocking into the insurance industry, the combination between industry and finance has been emerged. As a mushrooming capital with defined property right definition, the private capital has set foot in the insurance industry. The move, on the one hand, can promote the industrial innovation and financial deepening by transforming the dominance of state-owned shares, perfecting internal governance mechanism and improving the industrial competition structure (YuYang, 2010); on the other hand, most importantly, the peculiarity of private capital also can bring about some potential risks such as corporate governance risk, related transaction risk and solvency risk, which are always generally neglected so far in the economics and finance literature.

With the aid of modern property right theory, this paper gives an analysis of property right innovation and risk control for China's private capital accessing the insurance industry, with detailed structure as below: Section II analyses the property right innovation for private capital accessing the insurance industry. Section III analyses the potential risks for private capital accessing the insurance industry. Section IV puts forward constructive risk control measures for private capital accessing the insurance industry and the Conclusion in Section V.

## 2 Property Right Innovation for China's Private Capital Accessing the Insurance Industry

### 2.1 Improvement in industrial property right structure

Property right structure constitutes the core of organization structure. Changes in property ownership lead to changes in the structure of shareholders, and through the behavior preference of different shareholders, affect the company's behavior and business objectives, and finally the business performance of enterprise, i.e. property right – conduct – performance. The theoretical and empirical study by modern property right theory proves that the target behavior of private enterprises is more

likely approaching to profit maximization, while that of state-owned enterprises under non-market economy system is obviously deviated from profit maximization.

In China, the insurance industry has long been under the monopolistic competition among state-owned companies, with high degree of market concentration. Taking life insurance as an example. On the one hand, insurance companies dominated by state-owned capital are predominating in quantities; and, on the other hand, in market shares, for instance in 2011(see table 1), 56% of China's gross life insurance premium were occupied by four state-owned insurance companies: China Life Insurance Co., Ltd., China Pacific Life Insurance Co., Ltd., New China Life Insurance Co., Ltd. and TaiPing Life Insurance Co., Ltd., demonstrating that China's insurance industry, in quantity or market shares, is dominated by state-owned capitals. Being an essential way to property right reform, private capital accessing the insurance industry will contribute to the property right reform in two aspects: firstly, the private capital accessing the insurance industry, either in the form of share participation or holding, leads to the mutual cooperation and interaction between the private capital and state-owned capital that forms pluralism of property rights and interests in microcosmic subjects, and facilitates the solution of "absentee owner" and "insider control"; secondly, it will lead to mutual competition and complementation between the private capital and state-owned capital that construct a pluralism of property right structure from different subjects in the meso-industry level, and reform the monopolistic competition structure by state-owned capitals in China's insurance industry.

**Table 1 Premium Of Stated-Owned Insurance Companies**

Company	2010		2011	
	Premium (RMB, billion yuan)	Proportion of China's gross life insurance premium	Premium (RMB, billion yuan)	Proportion of China's gross life insurance premium
China Life	333	31.71%	318.3	33.29%
China Pacific Life	92	8.76%	93.2	9.75%
New China Life	93.6	8.91%	94.8	9.92%
TaiPing Life	33	3.14%	31.5	3.29%
Total	551.7	52.54%	537.7	56.24%

China's gross life insurance premium in 2010 and 2011 is 1050 billion yuan and 956 billion yuan respectively.

Source: Based on data from CIRC (China Insurance Regulatory Commission).

## 2.2 Improvement in corporate governance structure

Definition of property rights constitutes the basis of corporate governance, while the later is a solution mechanism adapted for the principal-agency issues occurred after the separation of ownership and management. Corporate governance's main objective is to achieve the enterprise value maximization through the settlement of absentee owner, insider control, moral hazard and other agency problems. In practice, corporate governance system is formed by the combination of the internal governance mechanism centered on the board of directors and the external governance mechanism based on product market, capital market, M&A market and managers market.

Establishment of an effective corporate governance structure has been an essential part of deepening the reform of China's state-owned insurance companies and establishing modern enterprise system. The access of private capital into insurance industry, endowed with defined ownership of property rights and stimulus, not only helps the definition of internal right, responsibility and interests of insurance company and improves the business efficiency of insurance company through internal governance; but also, no matter potentially access or accessed, will exteriorly impose a "competitive posture" toward existing insurance companies, either intensifying the market competition or through mergers and acquisitions in capital market, forcing them to improve internal governance mechanism.

## 2.3 Improvement in market competition structure

Apart from the property right arrangement and corporate governance structure in microcosmic level, factors that affect the corporate performance also depend on the market competition structure in meso-industry level. Beyond property-right theory finds, in the market with comparatively sufficient competition, average revenue has been increasingly improved after privatization of enterprise; while in the market with monopolistic competition, the revenue after privatization hasn't much significant increase. In other words, it is still not enough to improve enterprise performance only with defined property right, profit incentive will not work unless in a market with perfect competition. Also the main ideas of industrial economics believe that, the market structure and the enterprise behavior and market

performance are causally related, i.e. structure – conduct – performance. Highly monopolized and concentrated market will not only cramp the creativity of managerial personnel, but also result in distortion of economic signal, affecting the problem-finding and management improvement by property owner, which significantly affects the allocation of social resources.

Market competition pattern and industrial business performance will be improved after the access of private capital into insurance industry in the following two aspects. First, with the increase of insurance supply, to break down traditional state-owned monopolistic market competition structure, build an industrial structure with plural property right and the external competition force, thereby, facilitating the improvement of corporate governance mechanism by state-owned insurance companies as well as the improvement in industrial property right structure; Second, to lead to effective distribution and circulation of social resources (such as human resources, technical resources, etc) in the industry, thereby promoting the insurance company's or insurance industry's performance.

### **3 Potential Risks for China's Private Capital Accessing the Insurance Industry**

Owing to the peculiarity, private capital accessing the insurance industry also can be accompanied by a serial of potential risks such as corporate governance risk, related transaction risk and solvency risk while facilitating the property right reform and market competition in insurance industry, and may impose adverse impact on the economic, financial and social stability, which should be recognized and treated prudently.

#### **3.1 Corporate governance risk**

Corporate governance mainly deals with the relationship in three aspects, i.e. the relationship between the shareholders and the management, the major shareholders and minority shareholders, and the corporate and other stakeholders. Practically, corporate governance includes the governance structure, for instance the shareholder meeting, board of directors, board of supervisors and senior management, and the governance mechanism such as supervision and stimulation mechanism. Success may not be brought to a company by a sound corporate governance structure, but destruction will be definitely caused to any successful companies by the improper corporate governance structure.

##### **3.1.1 Shareholder meeting**

First, unduly decentralization and concentration of shareholding exist. Unduly decentralization leads to non-uniform value orientation, deficiency of common business idea and improper corporate governance; unduly concentration, even dominated by one shareholder, will infringe the interests of minority shareholders and cause functioning beyond the corporate governance. Second, some private capitals accessed in the insurance industry are just financial investors in the hope of acquiring fast capital premium through short-term turnover, lacking of long-term business strategy. Third, some private capitals have no continuing capital replenishment ability or the follow-up capital complement to the insurance industry is affected by the instability of its dominant business. These factors may intensify the business risk of insurance company.

##### **3.1.2 Board of directors**

First, members of board of directors, especially the chairman, is eager for quick success and instant benefits, prefers business development and capital scale to customer service and embedded value, neglects management foundation and innovative development. Second, the board of directors is generally controlled by major shareholders or core figures, especially in case of no independent directors, board of directors will be of little use if controlled by private capital in a holding position, thus decision-making risk will be intensified. Third, no evaluation as well as accountability mechanism is established for the member of board of directors, which resulting in no difference between due diligence and misconduct, and no accountability as well as punishment of dereliction.

##### **3.1.3 Board of supervisors**

At present, the major problem private capital insurance companies still face will be the absence of the board of supervisors. As the position and wage depend on the board of directors, especially on the chairman, members of board of supervisors usually lose their judgment over the decision made by board of directors, normally exerting no supervision over it.

##### **3.1.4 Senior management**

Professional manager market in China's insurance industry has achieved sound development, while senior managerial team is still labeled with "faction", the phenomena that "One managerial personnel always participate in and leave away with a team" is quite commonplace in China's insurance industry, especially in private capital invested insurance companies.

### 3.1.5 Governance mechanism

The prominent advantage of private capital lies in the property right which also put it in an inferior position, since by its unique advantage in property right, the combination of ownership and management, as well as of chairman and general manager usually occurs, and in practice, impedes the formation of scientific governance mechanism.

### 3.2 Related transaction risk

Related transaction refers to the resource or obligation shift among related parties, irrespective of whether the shift is charged or not. Two forms of relationship between related parties may occur in insurance or insurance asset management companies: the connected relationship with legal persons, and the relationship with natural persons. The former one is mainly the connected relationship among those legal persons that can directly or indirectly control, jointly control insurance company or exert significant influence on the insurance company, and the connected relationship among those legal persons directly or indirectly controlled by related natural persons. Related natural persons mainly include: individual investor that holds a certain proportion of shareholdings in an insurance company; senior management in insurance company; and those close relatives and families of major individual investors and senior management, etc. Related transaction, different from general market transaction, has its uniqueness lies in the lacking of fair market competition during transaction, and in its intricate, to some extent, transaction relationship among transaction subjects. As private capital generally accesses the insurance industry in the form of the combination between industry and finance, related transaction may emerge in the following aspects:

#### 3.2.1 Supply capital to dominant business

Generally, the combination between industry and finance is designed to reduce transaction cost. Insurance company that capable of collecting large amount of financial capital is likely to supply capital directly or indirectly for private capital when its dominant business is in need of capital support or facing financial difficulty.

#### 3.2.2 Investment along with shareholders

The other purpose of private capital accessing the insurance industry is to create the synergistic effect, i.e. private capital achieves synergistic investment or capital operation through subsidiaries under its control, for instance, trying to gain much profit with less investment in a real estate project by direct or indirect joint investment.

#### 3.2.3 Benefit transportation to shareholders/senior management

It mainly refers to the benefit transportation offered by insurance company which, under the control of shareholders or senior management, conducts related transaction with other industries (i.e. E-commerce, IT business etc) under the control of shareholders or senior management.

#### 3.2.4 Accept insurance of shareholders at low costs

It mainly refers to the fact that private capital invested insurance company, at the price lower than the market or actuarial cost, underwrites the life or property-casualty insurance of its shareholders, which indirectly achieve the benefit transportation to shareholders, damaging the interests of other policyholders.

### 3.3 Solvency risk

Solvency refers to insurance company's ability to pay debts. In accordance with the relevant regulations of China Insurance Regulatory Commission (CIRC), insurance company should possess the proper amount of capital corresponding to its risk and business scale, its solvency ratio should not be less than 100%. With the ever-growing scale of business and establishment of branches, capital supplement should be continuously required to comply with the supervisory requirement in solvency. Practically, solvency risks encountered by private capital accessing the insurance industry are mainly caused by the following factors:

#### 3.3.1 Imbalance in business structure

"Market share" strategy is normally adopted by private capitals that accessed the insurance industry, i.e. to seize up market shares by expanding business scale instantly while neglecting or rarely taking into account the business quality, expenses, and liability cycle. Then, bancassurance becomes the strategic growth point for many private capitals accessing the insurance industry, for instance, Guohua Life, because bancassurance, compared with personal agent insurance and group life insurance, can be expanded in large scale in short-term. If taking an analysis of the embedded value of bancassurance, while, less value space but heavier liability pressure is left for bancassurance due to the high agent charges and commitment for high returns. Excessive pursuit of business scale and the capital consumption type business mode have frequently led to the imbalance of business structure as well

as intensified the solvency risk of insurance company practically.

### 3.3.2 Capital market fluctuation

Insurance industry is always accompanied by risks. The product pricing and capital operation always affect insurance company's risk resistance capacity, then the solvency of insurance company because of the capital market fluctuation. In product pricing and currency policy risk, the change in interest rate may result in risk of cancellation of insurance, for instance, the prevalent vigilance against the cancellation of bancassurance. In the capital operation and investment management risk, the systemic risk or non-systemic risk in capital market such as the market risk directly affects the investment performance of insurance company as well as its solvency ability, for instance, in 2011, a year of sluggish capital market, many insurance companies were confronted with supervisory pressure of inadequate solvency. In this case, the cash flow of insurance company may be severely affected, even faced with bankruptcy risk if the ability of private capital to supplement capital is limited.

### 3.3.3 Insufficient provision for reserve

Reserves constitute the ground of solvency of insurance company. According to China's Insurance Law, insurance companies have to make appropriation of reserve for undue duty and outstanding losses. For the newly established insurance companies, owing to the large amount of budget occupied by the new contracts/policies, their burden in capital supplement will be intensified by the reserve regulation; furthermore, the actuarial assumption and reserve appropriation standard adopted in practice by different companies will directly decide if the reserve appropriation is sufficient. Owing to the pressure from business profit, capital complement or the appropriation of reserves, careless provision for reserve will directly affect the solvency ability when private capital is accessing the insurance industry.

Table 2 summarises the potential risks for China's private capital accessing the insurance industry and their affected factors.

**Table 2 Potential Risks for China's Private Capital Accessing the Insurance Industry**

Type of risks	Risk factors
Corporate governance risk	shareholder meeting
	board of directors
	board of supervisors
	senior management
	governance mechanism
Related transaction risk	supply capital to dominant business
	investment along with shareholders
	benefit transportation to shareholders/senior management
	accept insurance of shareholders at low costs
Solvency risk	imbalance in business structure
	capital market fluctuation
	insufficient provision for reserve

## 4 Risk Control for China's Private Capital Accessing the Insurance Industry

As a product emerging at the certain stage of economic system reform and the development of market economy, private capital accessing the insurance industry is accompanied by a series of risks while accelerating the capital accumulation and financial deepening. D Long Event and Min Fa Securities Event, even though not occurred in the insurance field, are similar with insurance in nature. For private capital accessing the insurance industry, the move should be encouraged by making full use of its advantage, but also be rationally guided for normal development, and thus promoting the continuous and stable development of insurance industry.

### 4.1 Supervision system

"Supervision", by its very nature, refers to the activity of government to regulate economy under market economy. Government supervision will be required to make up the market flaw when the market failure occurs owing to the externality or information asymmetry.

#### 4.1.1 Establishment of risk supervision system

Adhering to the strict regulatory theory, to achieve the quantization and systemization of risk indexes such as the solvency risk, capital operation risk, corporate governance risk, business operation

risk and related transaction risk, forming effective supervision index system.

#### 4.1.2 Establishment of networking supervision system

To unify the external ports of insurance company, which should be the acceptance standard for the opening of private capital invested insurance company, achieve the interlinking between the core business system and core financial system of insurance company and the supervision system of regulation department, thereby, implementing effective monitoring over important business activities and capital transactions of private share participated or holding insurance companies.

#### 4.1.3 Combination of filed supervision and non-field supervision

First, improve the system construction, index analysis and key point monitoring for non-filed supervision; second, regularly or non-regularly conduct filed inspection or key point inspection, even an investigation to guard against and preclude serious risks.

#### 4.1.4 Combination of administrative supervision and legal supervision

In practice, comprehensive supervision measures such as the economic means, legal means and administrative means will be carried out to intensify the regulation, as well as to improve the awareness of “Cost of breaking the law” of subjects.

#### 4.1.5 Combination of market access and withdrawal

To formulate and improve the market access and exit mechanism of insurance company, both by drawing abroad market experience and taking example by abroad legal regulations in market access and withdrawal for financial institutions. First, encourage and guide private capitals with strong strength, sound management and promising profit future to access the insurance industry; second, to regulate and deal with those companies that still have much room to be improved according to their management ability and capital quality, and guide private capital to access and withdraw insurance industry by comprehensive use of introducing the strategic investors, M&A, etc.

## 4.2 Corporate governance

### 4.2.1 Shareholder meeting

First, the source and nature of capital must correspond to the business requirement of specific industry or enterprise. Private capital, generally, can be classified into: financial capital and strategic capital. Financial capital, for insurance industry, can supplement short-term circulating capital, while for long-term, more strategic capital will be required by the development mode and profit cycle of insurance industry. In fact, regulation department, when reviewing the private capital planned to access insurance industry, is required to perform an objective assessment of its nature, for instance, issue the supervision guidance to check and confirm the sustainability of private capital after accessing the industry in light of capital strength, profitability, management level, development strategy and business ideas. Secondly, reasonable shareholder structure is a must. Studies show an inverted U-shape relationship between the concentration degree of shareholding and the governance effectiveness, therefore, a reasonable shareholding structure between major shareholders and other main shareholders will be more conducive to the corporation governance. Unduly concentration of shareholding and dominance by one shareholder affects the corporate governance; while unduly decentralization will leave the company unattended, also causing adverse influence to the governance. So, it is desired to achieve mutual complement in capital strength between private capital and state-owned capital as well as private capitals that accessing the same insurance subject.

### 4.2.2 Board of directors

First, members of board of directors assigned by the private capital should possess industrial management experience and professional knowledge, such as the knowledge in finance, laws and risk management, which should be under the supervision and guidance of regulation department. Second, strictly comply with the separation of position like the chairman and the general manager, and improve the decision making procedures of board of directors, therefore preventing major decisions that made solely by chairman but the board of directors.

### 4.2.3 Board of supervisors

On the one hand, strengthen the right of supervisor, for instance, the board of supervisors should be endowed with substantive rights such as hiring or dismissing accounting firm, the right to be informed and the interpellation and veto power; on the other hand, the supervisors with “dereliction of duties” must be held liability.

### 4.2.4 Senior management

Encourage making full use of the property right advantage of private capital, improve the construction of senior management team through the separation of ownership and management, and establish the incentive and restrictive mechanism to draw and stimulate talents in varied forms, such as



the annual salary system, performance related compensation and stock options.

#### **4.3 Internal management**

##### **4.3.1 Internal system construction**

Sound corporate governance closely rests on sound internal management system. Due to the limited experience in insurance industry, for private capital accessing the industry, in order to guide the normalization of company operation through system norms, particular attention should be paid to such system construction as the capital replenishment system, funds application system, financial management system, related transaction system, risk management system, compliance management system, anti-money laundering system, internal audit system and compensation incentive system.

##### **4.3.2 System and workflow construction**

Technical support and reasonable workflow should be important ways for risk prevention. In running insurance company, for instance, the alignment between business and financial system, between the insurance company's system and regulation department's system, and the consistency between business data and financial data, all require the IT technology, system and workflow of insurance company should be reasonably planned, both supporting internal governance and external supervision.

##### **4.3.3 Staff and operation construction**

Staff and operation risk becomes another source of modern financial risks. Staff's intentional or mistaken failures, for instance, violation of operation procedure or system requirement in settlement of transaction, may result in risk or loss. Therefore, apart from improved corporate system and workflow management, staff training, education, evaluation and work shift are also important means for preventing staff and operation risks.

##### **4.3.4 Construction of subject of liability**

Responsibility and labor division for members of senior management, such as chief executive officer, chief actuary, chief financial officer and chief risk officer, should be clear-cut, and have all members respectively held liability for their duties.

#### **4.4 Social supervision**

Supervision is a systematic engineering, which requires not only government supervision, but also the full utilization of social supervision, such as supervision by self-regulatory organizations in the insurance industry, by staff and social public, by social media and public opinion, by credit rating agencies and accounting firms, etc. Only a variety of supervision forces and measures combined can produce the social supervision mechanism and effectively prevent risks.

### **5 Conclusion**

Private capital accessing the insurance industry is the natural product of the economic system reform and the development of market economy in China. First, it plays a significant role in improving the structure of industrial property right, corporate governance mechanism, and creating perfect competition environment; while on the other hand, owing to the peculiarity of private capital, some potential risks such as corporate governance risk, related transaction risk and solvency risk, will be accompanied by when the capital accesses the industry, and may, when worse, affect the stable operation of China's financial industry. For private capital accessing the insurance industry, on the one hand, the move should be encouraged by making full use of its advantage; while on the other hand, for the health and sustainable development of the insurance industry, the progress should be rationally guided by the supervision department, and all these potential risks and their effects should be further studied in practice.

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## An Assessment of Intrinsic Versus Extrinsic Motivational Factors in the Namibian Public Sector

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**Abstract:** This paper is a study designed to understand how intrinsic rewards, as compared with extrinsic rewards are perceived as sources of motivation by employees of the Namibian public organizations/ ministries. This article focuses on the work motivation construct applied to the public sector particularly the government ministries. We try to identify the combination of extrinsic and intrinsic factors explaining why public employees show varying levels of work motivation. The findings of this study shows intrinsic reward factors are the main drivers of work motivation in the Namibian public sector.

**Key words:** Intrinsic Rewards;, Extrinsic Rewards; Motivation

### 1 Introduction

The aim of this study is to understand what motivates employees to work in public organizations; in particular, to consider the importance of intrinsic factors in the motivation of people to work in and remain in the public organizations sector despite being paid less than their private sector counterparts. Motivated employees are the cornerstones of all organizations, as work motivation is one crucial determinant of individual and organisational performance. This holds true in the private, the public and the non-profit sectors.

Perry and Hondeghem (2008) capture the underlying universal essence of public serviced motivation as "an individual's orientation to delivering services to people with a purpose to do good for others and society". What is consistent with all of these treatments is the notion that in the work context public service motivation means the valuing of intrinsic job rewards at a higher level than extrinsic ones. Intrinsic rewards are derived from the satisfaction an individual receives from performing a task. At times individuals engage in work tasks out of an inherent interest in the activities (enjoyment-based) and because they find the work to be meaningful owing to a commitment to self-defined goals or social norms (obligation-based) (Deci, Koestner, and Ryan 1999; Frey 1997; Osterloh, Frey, and Frost 2001). In these instances the motivation to act resides within the individual and is self-determined (Frey and Osterloh 2002). Examples of these are a sense of accomplishment and a feeling of self worth. In contrast, extrinsic rewards are those offered to an employee by someone else. Work is merely a means to an end in that it provides a salary necessary to satisfy an individual's true needs. Individuals engage in work activities to attain rewards or in response to commands. Thus, the reward emanates from a source outside the worker and the locus of causality for the behavior is external (Deci and Ryan 2000). Based on this view of human motivation, performance-related pay is ideal for motivating worker behavior. Examples of extrinsic rewards are a pay raise, promotion, job security, and status and prestige. Herzberg (2003) argues that money is a "hygiene factor", and cannot be a source of motivation. However, if the hygiene factor (in this case, pay) is perceived to be inadequate then the employee will be dissatisfied. Intrinsic rewards are personal, "internal" responses, such as satisfaction or pride in an accomplishment.

### 2 Role of Motivation in the Organization

Why do organizations need motivated employees? The answer is for the survival of the organization. In the increasingly competitive, rapidly changing world of business, the public sector has pivotal role to play in nation's economy, therefore a motivated workforce is a great asset. Motivated employees are more productive, committed and loyal to the organization. Motivation is the key among the factors for effective performance. Tosi, Rizzo and Carroll (1994) indicate that performance is the result of ability and motivation of employees.

Thus,  $Performance = f(Ability + Motivation)$

Robbins (1998) adds opportunity to the equation of performance thus:

$Performance = f(Ability + Motivation + opportunity)$

Robbins argues that even though an individual may be motivated and has the ability to perform there could be obstacles that constrain opportunity to perform. The characteristics of motivated employees are:

they always want to come to work; they want to be part of teams at work; they are interested in helping and supporting others at work; and they generally exert greater effort in their work and contribute more in the organization.

### 3 Analysis of Intrinsic versus Extrinsic Factors

The factors of Intrinsic and extrinsic that motivate employees to choose a job, and to stay in it, are complex. This study shows that public servants in Namibia are driven by a great deal of intrinsic rewards more than how much they can earn (extrinsic). Many employees place more importance on less tangible factors, such as a feeling of accomplishment, being effectively managed, and having challenging work. The study basked public servants to consider how important nine aspects of their work were to them (see Figure 1). Three factors emerged as "Highly important" to more than three out of every four public servants: A feeling of accomplishment (90%), Effective management (84%) and Challenging work (77%). Of the remaining six workplace factors (shown in Figure 1), pay and benefits was rated next, in fourth position overall. This factor was seen as "Highly important" by nearly three quarters of public servants.

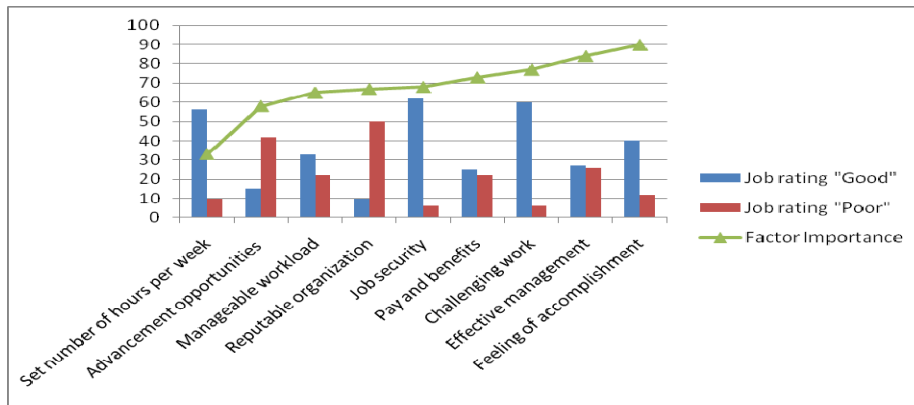


Figure 1 Importance of Workplace Factors for Employee Motivation and Organisation Rating

#### 3.1 A Feeling of Accomplishment

The top priority for staff in carrying out their work was a feeling of accomplishment. Eight out of ten public servants considered this to be "Highly important". 40% of public servants rated their organisation as "Good" at providing a feeling of accomplishment. Qualitative results confirmed that some public servants did not feel that their skills and experience were recognised, and did not feel valued. Lack of positive feedback and recognition were cited as reasons for some public servants not having a feeling of accomplishment in their work.

#### 3.2 Effective Management

Effective management is the one that clearly and regularly communicates with employees. Although 84% of public servants considered effective management to be "Highly important", over a quarter of them (26%) rated their organisation as "Poor" at providing it. A proportion OF (27%) rated it as "Good". Despite the efforts that have been made to improve the quality of management within the public service, it seems many staffs still do not see management as sufficiently effective.

#### 3.3 Challenging Work

Public servants' desire for challenging work ranked as the third priority, with more than three quarters of public servants considering it "Highly important" for them to be motivated. Although there is a gap between those who think challenging work is "Highly important" and those whose expectations on this are being met, most public servants appear to be relatively satisfied with the amount of challenging work they have to do.

#### 3.4 Pay and Benefits

Public servants' pay is low compared to private sector in Namibia but they value pay and benefits as not major motivator, it can be a powerful disincentive when staffs feel dissatisfied with it. However, this factor was less important to managers than to their non-managerial colleagues as qualitative information showed some dissatisfaction with pay. This was particularly in relation to salary bands, and the difficulty in being promoted to a higher band. Some public servants were unhappy with their organisation's performance pay system.

### 3.5 Job Security

A high proportion of public servants have their expectations regarding job security reasonably well met. Finding a new position is likely to be difficult due to high job seekers in the labour industry as unemployment rate in Namibia is above 40% according to 2010 statistics.

### 3.6 Reputable Organisation

Working for a reputable organisation is rated as "Highly important" to public organisation's employees. In terms of recruitment and retention, the perception of enhanced reputation is positive for the public service as a key motivator.

### 3.7 Manageable Workload

Feeling that their work is too pressured is a common complaint from working people. Having a manageable workload is something that almost two thirds of public Employees rate of motivational importance.

### 3.8 Opportunities for Advancement

This factor was considered "Highly important" by most public servants to enhance their motivation and thus their job satisfaction that increase performance respectively. However, results of this paper generally reflected dissatisfaction with the availability of opportunities in public sector organisations. There is very little room for advancement, as the organisations are very flat, structured ones but huge.

### 3.9 Set Number of Hours per Week

Having a set number of hours that they worked each week was not a high priority for public servants - only a third rated it as "Highly important". Their level of satisfaction with this factor was reasonably high, with 56% rating their organisation as "Good" at providing a set number of hours per week. Only 10% of public servants thought their organisation was "Poor" at providing this. Number of hours per week is favourable for staffs in the public sector to achieve a good work/life balance and have fun at work. The time for family is essential for workers and therefore having that job that allows room to balance work and life keeps employees motivated and satisfied with their work.

## 4 Conclusions

The paper clearly showed intrinsic rewards dominate extrinsic factors of motivation; most public servants are motivated by intrinsic rewards such as the feeling of accomplishment in their work. They also want their jobs to be well managed and challenging. While most public servants appeared to find their jobs sufficiently challenging, a relatively high proportion were dissatisfied thus not motivated with the effectiveness of management in their organisation, signalling that more work needs to be done in this area. Pay and benefits was not among the highest work priorities for most public servants, but is found relatively more important to some staffs. Opportunities for advancement have become more important to public servants in Namibia though it's still a challenge for the government to solve this. Public sector employees want a reasonable degree of job security to be motivated and satisfied with their jobs. In terms of attracting and retaining talent, public servants' perceptions of the reputation of the organisations/ ministry where they work portray positive results for the public service.

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# Research on the Moral Education Management in Universities Under the Network Environment

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**Abstract:** By using the empirical and functional analysis methods, this essay discussed how to effectively improve the moral education in universities under environment of network. Under the influence of network, the moral education in universities is a complex problem. Through a long time research, we changed our education concept; explored new ways and methods of education; we improved the network management mechanism. After all this research, the conclusion comes as follows: to really improve the actual effect of moral education in universities we must face challenges with the proactive attitude; Establish a sound moral education management mechanism, use the advantages of network and avoid the disadvantages of it.

**Key words:** Network environment; Colleges and universities; Moral education management; Mechanism

## 1 Introduction

In the early 90s for last century, network in China has got rapid development. According to the '29<sup>th</sup> China Internet network development statistic report' published by China Internet Network Information Center (CNNIC) in Beijing, it showed that in 2011, including the college degrees and above, their Internet usage has reached 96.1%. The network comes into every college students' daily life. Under the environment of network, how to do well in the moral education in colleges and universities becomes a new problem.

The Moral Education is not only put forward in China, but also studied by many foreign scholars. Most people agree that teacher is an important contributor to the student moral education [1]. Beyond that, the great influence of medium in forming teenagers' moral system has been proved, which means the network technology should be a positive guide [2]. The Chinese scholars, GuHaiLiang once said that 'in the 21st century, we are facing with a new task: the political education in Internet ideological. Some Chinese researchers also pointed out the importance of the network media platform; they thought that the advantages of online community could enhance the initiative of students' moral education [3]. But the lack of the research in university moral education management system is obvious. This paper focuses on the new ways and methods of moral education from, and the improvement of university network management mechanism.

## 2 Education Guide Moral

### 2.1 To set up an open moral education concept

The traditional moral education is under the situation of closed campus, which is much easier to control in one hand, but lack of enthusiasm and initiative in the other hand. Traditional didactic education highlights the many deficiencies, for example, management of relatively stiff, and relatively inflexible way, one-way dissemination of information to make educated and lack of enthusiasm and initiative. In the international generation, the traditional closed campus is no longer closed, the walls are unable to block the stream of information, and the closed moral environment has ceased to exist. Under the globalization background, our college students are in the world that unbelievable opened and related to them. Their vision has been no longer limited to the people and the things just around, their thought becomes more actively and freely. More than ever, they care about the changes and developments of international situation. Their self-awareness, competitive-awareness and enterprising consciousness are gradually increased. They not only need the global knowledge; but also need the global vision, courage and moral. As to respect other's life, they not only need to understand their own country, their national values and their moral standard; but also need to know as much as possible about other countries around the world. Therefore, the workers of university moral education have to think more than one school, one country. They must update their own ideas, widely open their mind, and increase their knowledge. Only with the high personnel qualities, we can participate in global competition.

## 2.2 To set up the “people-oriented” concept

“People-oriented” or “People-centered” means to respect one's need, pay attention to the comprehensive development of man. The development of human society and the development of education lead to this policy. In the Internet era, student is the main object for the university moral education. In order to set up the “people-oriented” concept of moral education, changing the idea of infusion into the idea of guide is very necessary. Firstly, the essence of education is to educate people. Education is a planned activities, its essence is to educate people, and the most important mission of it is to mold human nature, cast healthy personality. In short, education is to teach people how to be a good human being. Sperry, the founder of the contemporary education, pointed out: “Education is by no means just simple cultural transmission. Education should be the mind awakening. That's the truly meaning of education.” College education is the a higher stage, “a real university should be the best place to seek the truth, to grow freely; it should be the place full of the understanding of human value; it should be the place student can pursuit the meaning of life. Under this environment everyone is purified, full of solemn.”<sup>[4]</sup> Therefore, in the network environment, the moral education should focus on educational guide, teach students to find the way to have their own judgment. Fully respect to one's dignity, highly concern of one's opinion of value, to establish the "people-oriented" concept. In daily education, introduce the advanced positive social thought in modern society. In the same time, not avoiding the negative information, including some bad social phenomenon and campus style, but to guide students to analyze this phenomenon by using scientific point of view in a easy acceptable way. This is quite helpful for them to establish an excellence behavior form in their future life.

## 3 Exploring New Methods of Moral Education

Under the network environment, moral education has new characteristics and rules. To explore the new ways of working means to improve the scientific, the pertinence, and the effectiveness of moral education; to enlarge the coverage, attraction and influence of moral education in a efficient way.

Ideological and political work always needs to keep pace with the time, to keep developing with the time<sup>[5]</sup>. Using network technology to promote the teaching theory and teaching method is the main channel and the basic link in this higher education stage. The course teachers must fully understand Marx's theory. They must use the theory skillfully, and they also need to have the consciousness to proceed with the reform.

Over years, in some colleges and universities the same problems are existed for long time. Firstly, they usually pay more attention on the theory teaching, focus on the theory elaboration; and pay less attention on teaching student to solve some real problems. Secondly, “one-way teaching” still takes an important part in classroom teaching. Teachers just finish their missions in class, not communicate or have little communication with their students. Thirdly, teachers' teaching enthusiasms are much concerned, but lack of improving the students' learning initiative. More over, the traditional teaching methods still hold the main part, modern technologies and methods seems useless. The teaching methods and means are out of time. It's hard to stimulate students' learning initiative and enthusiasm in learning. In the network age, we only have two ways to go. By changing the traditional education methods, we can help students to understand the mainstream culture and ideology. Or do not change the traditional education methods, the network's negative information will find their place in our students' mind. Therefore, the ideological and political theory course teachers must study deeply, to find out the routines. Teaching activities should be “people-oriented”, pay attention to learn the Marx's theory, and help student's fully understand those theories, then teach them to use their knowledge to build their moral form.

### 3.1 To carry out the “people-oriented” concept by rousing self-conscious

In order to truly understand the Marx theory, it requires students' own experiences and sentiments. The Marx theory is a theory, which helps students to form their scientific worldview, their outlook on life and their values. It must be "in mind" and "Internalization", that's to say, it must understand by themselves. Only after that, the teaching aim and requirements of this course is reached. The teacher should clearly know what problems the students are facing with; during their growth what kind of knowledge or political theory are required. Teachers must think from every different aspect, and according to the different needs of students, choose different teaching methods. Such as seminar, lecture, class discussion, social practice, it should be changed according to the needs. And as well as multimedia teaching, network classroom or some other types of teaching, they can be combined or separated, so that students can learn, can understand, can practice and then use.

### **3.2 To carry out the “people-oriented” concept by using “internalized”**

In a certain degree, knowledge of “Internalization” is knowledge “into the mind”. The original propose of having the Marx's theory course in colleges and universities, doesn't mean to learn the theoretical knowledge of policy; but to train students to use Marx theory to analyze the problems; to have the ability of solving problems; to help and to guide the college students to establish the correct worldview, outlook on life and values. The Marx theory is different from other specialized knowledge. Their point of view and their theory is a kind of natural view, social view and world outlook. It learned in order to train students to become builders and successors of our socialist cause. That's why we must take the Marx theory into students' intrinsic ideological and political quality and ability, to make the Marx doctrine to become college students value criterion and the guide to action.

## **4 The Research of Moral Education under the Network Environment**

Under the network environment, moral education in colleges and universities must pass a series of standardizing and guiding system to develop. Therefore, we must understand the characteristics of network, and their development trend in first place, and then gradually improve the university moral education work mechanism.

### **4.1 To strengthen the management mechanism**

The network is taking more and more important place in the modern society. It's important to the science and technology improvement; it's important to information transmission and communication; it's important to the business operation. With the increasing importance of network, the Internet crime is also spreading quickly. Those crimes are widely involved, strongly concealment, greatly harmed. At present, we are strengthening the management of network, and the management system, legal system establishment is just in the initial stage. As Negroponte 'being digital' said "The Road in Heaven was also need some traffic control." [6] To strengthen Chinese college moral education through Internet, we must establish a set of network monitoring and management mechanism, in order to prevent bad information and influences.

First of all, we must establish the laws and constantly improving the legal system. The law is important to regulate network behavior. Network technology in China started relatively late, but the Chinese government works very seriously on network management legislation. In recent years, we have introduced many network security, and the laws of information management also carrying out rapidly. With the development of network technology, network crime also becomes more and more complex, the corresponding improvement of laws and regulations should be further strengthened.

Secondly, pay more attention on the monitoring the network technology is quite necessary. Although the network is a "virtual" world, but as long as the technology improved, the sufficient self control ability of technology can largely prevent network anomie behavior to occur.

Last but not least, to establish the information review system is necessary. The information ability is the important indicator of a country's ability. The information law system is the important symbol to measure the information level. To do a good job in the university moral education work under the network environment, colleges and universities network publicity department should also apply the necessary administrative means, and gradually establish information release system. For example, the forum and micro-blog are required the user's real name, "the network real-name system" is controversial, but it is still an effective kind of management pattern.

### **4.2 To strengthen the construction of moral education work team**

Under the network environment, we should strengthen the construction of network moral education work team. Training of a profound political theory of both levels: Marxism-Leninism theory training and the art of moral education work. Workers can operate the network of moral education work team by using the update technologies, and can grasp the initiative in the same time. This requires colleges and universities to build a team with counselors and teachers. They are the main body of the special combination of network moral education team. We should not only strengthen the universities network moral education workers ideological and political quality cultivation, but also greatly improve the information quality of moral educators.

### **4.3 To improve the safeguard system**

Under the environment of network, the university moral education job should be done efficiently and to make sure it falls in practice. In order to reach this aim, we must have a set of safeguard system. To begin with, to improve the leadership and the management; and to do real things to insure the work is well organized. The development of network moral education in colleges and universities is more and

more complex, we should establish a system, which leaders by University administrators, propaganda departments, student work department; and the Full-time education cadres, student counselor, ideological and political teachers are as the main multi-level of the network management system. By using QQ, BBS and other campus network platform for targeted work, Shown in Figure 1. Secondly, we should keep cooperating with the government, schools and families. Make sure the campus network environment is secured. After that, colleges and universities still can find a lot of supports in the modern society.

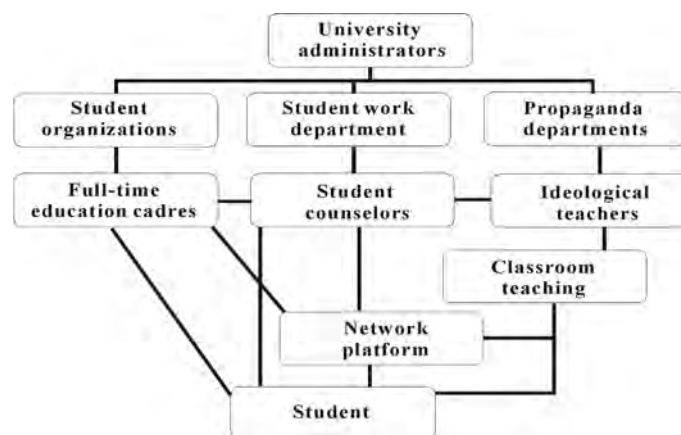


Figure 1 College Moral Education in the network environment management system

## 5 Conclusion

The promotion and development of network technology shows that human society is gradually changed from the industrial society to the information society. It will shape a new form of survival. College students are the most related group with network, and by using Internet they get to know the world and the society. Network influences their ideas and value orientation; influences their way of thinking and behaving. The magic of network can be seen in every important aspects of a student's life. This gives the traditional moral education a big challenge. But the advantages and disadvantages of science is always two sides in a same coin, only depends on how people use. As long as we tightly grasp the time pulse, and carry forward the positive influence of network; eliminate the negative effect of network in time; guide our young students correctly; establish a sound moral education management mechanism; make the network as a new carrier for the moral education in colleges and universities. After all, we can turn "passive" into "active", turn "bad" into "good"; we can create a new situation for the moral education in colleges and universities with the right help of network.

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# Research on Inclusive Financial System in China: From the Perspective of Financial Support for Disadvantaged Fields\*

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**Abstract:** This article studies the theory, structure and function of inclusive financial system in China through examining the financial exclusion of disadvantaged fields. It highlights the importance of building an inclusive financial system for supporting disadvantaged fields, and explores a system model with the cash flow and information flow which can integrate microfinance and the separate parts of the system into a unity. The study proposes that building an inclusive financial system should integrate the excluded, coordinate all components and follow the evolutionary laws of the system.

**Key Words:** Inclusive finance; Microfinance; Disadvantaged fields; Financial exclusion; System theory

## 1 Introduction

With the development of microcredit and microfinance, United Nations proposed the concept of inclusive financial system, aiming to propagandize “International Year of Microcredit 2005”. In 2006, Jiao Jinpu and Du Xiaoshan first introduced the inclusive financial system to China. Because it is related to the issues of financial, economic, social development closely, inclusive financial system has garnered considerable attention, and its role has also been recognized by more and more Chinese scholars and experts in related fields. Besides, the intention of inclusive financial system is substantially consistent with “Inclusive Growth” and “Harmonious Growth” which have been widely advocated in China in recent years. For China, building an inclusive financial system mainly aims to solve the practical problems that disadvantaged fields are often financially excluded.

In recent years, China has made efforts to support disadvantaged fields through the adjustments of financial institutions and the reforms of financial systems. But we have to acknowledge that there are still many difficulties to be overcome, since the financial exclusion of disadvantaged fields has been long existed, and too complex to be solved in the short term. Looking into the fundamental cause of disadvantaged fields, we can find that the imbalance and unreasonable allocation of economic resources should take responsibility. So how to make resources available for both advantaged and disadvantaged fields equally has become an important issue in China. Inclusive financial system is that committed to this issue and plays an irreplaceable role in supporting disadvantaged fields. Hence, in China, there is an urgent need to build an integrated financial support system for disadvantaged fields along with the existing efforts, which we can define as “Inclusive Financial System”.

We proceed in Section 2 with a review of related literature. In Section 3, we define the inclusive financial system and the characteristics of disadvantaged fields in China. Section 4 examines some countries’ experience and compares them with China. In Section 5, we design the structure of China’s inclusive financial system with the system theory. Section 6 puts forward some suggestions.

## 2 Literature Review

### 2.1 Researches on inclusive financial system and the related fields

Modern microcredit emerges as a market solution of poverty alleviation. Then, Stiglitz, a leading economist who utilizes the theories of information economics and imperfect competition in studying the mechanism of microcredit, comes up with the theory of microfinance. Consultative Group to Assist the Poor (CGAP, 2004) studies the eleven key principles of microfinance and argues that microfinance means building financial systems which serve the poor. Researches in China show that inclusive finance which serves for vulnerable groups, disadvantaged industries and poor areas can play an important role in promoting the development of these fields (Meng Fei, 2009). And we should take actions to introduce new categories of financial institutions, attract private and foreign capital, and integrate the microcredit into formal financial system (Huang Wensheng et al., 2009). Hu Guohui (2012) examines the special financial structure in China, and suggests that building an inclusive financial system in China doesn’t

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necessarily lead to exclude the large nation-owned banks, which is different from most other countries. By and large, though there is a loud voice on building inclusive financial system, researches directly related to it are very limited. And the majority merely mention the term of inclusive financial system in policy recommendations, not discuss in-depth what the system really is and how to build it. Thus, there is still lack of independent, systematic and comprehensive researches on inclusive financial system.

However, there are relatively rich findings on microcredit, microfinance and rural finance, closely related to inclusive financial system. Especially, in China, with the asynchronous financial development in urban and rural areas, rural finance is always the first and foremost pivot. Wang Shuguang et al. (2011) mention that there is a Double Financial Dualism in China which is characterized by the oppositions between urban and rural finance, formal and informal finance, so rural financial reform is important to inclusive financial system. Zhou Mengliang et al. (2011) point out that there are two different tracks in China's rural financial reform—outside or inside the financial system, the former is carried out by the People's Bank of China (PBC), mainly about allowing private capital to microfinance, the latter is led by China Banking Regulatory Commission (CBRC) emphasizing the reform of rural finance institutions. Though those researches haven't adopted the term "inclusive financial system" directly, they do imply the idea of "inclusive", which provide us important research grounds, references and inspirations.

### **2.2 Researches on financial support for disadvantaged fields**

Vulnerable groups, such as the poor, women, children and the unemployed, are first concerned as disadvantaged fields by sociology in some countries. However, researches in China pay much attention to farmers, migrant workers and urban poverty. From a sociological viewpoint, researches demonstrate that disadvantaged fields result from the segmentation of urban and rural systems, social discrimination and the lack of education (Wan Baoying, 2009). And researches in economics note that low elasticity of demand, decreasing marginal revenue and diseconomies of scale also contribute to its severity (Zhang Feng, 2007). Financial support for disadvantaged fields is usually considered as a power that can promote economy growth. Gurley and Shaw (1967) maintain that the innovation of financial technology can support the economy growth. And McKinnon and Shaw (1973) emphasize the role of finance in promoting economic growth in developing countries. Zeng Kanglin (2005) proposes the conception of establishing special poverty-alleviation financial institutions for the vulnerable groups. Though there are relatively rich researches on financial support for disadvantaged fields, they are in different independent fields. And no discussion is carried out from the perspective of system evolution on how to integrate those marginalized or excluded fields into a mutual and harmonious financial system.

## **3 Theoretical Framework**

### **3.1 Definition of inclusive financial system**

The concept of inclusive financial system originates from the theory and practice of microcredit and microfinance but much broader than them. Modern microcredit emerged in 1970s in some countries, and then in 1990s the term of "Microfinance" gradually took the place of "Microcredit". During the following years, microfinance has developed rapidly as its participants, products and services become more diverse and abundant than ever before. People began to realize that microfinance, as an important tool for poverty alleviation, shouldn't be marginalized or excluded from the formal financial systems. So, in 2005, United Nations proposed "Building Inclusive Financial Sectors to Achieve the Millennium Development Goals", and indicates that an inclusive financial sector offers to the vast majority of the population sustainable access to a range of financial services suited to their needs.

CGAP (2004) defines inclusive financial system as an integration of microfinance into formal financial systems to ensure permanent access to financial services by significant numbers of poor people. The term "poor" refers to everyone excluded from access to financial services who might potentially be able to use financial services effectively, including not just the "extreme poor" but also wealthier, whereas still vulnerable. Du Xiaoshan (2006) points out that inclusive financial system is a system which turns microcredit into an integral part of the mainstream financial system, satisfying the basic financial needs of the majority. Jiao Jinpu (2009) believes that an inclusive financial system, constituted of financial institutions, services, instruments, laws and regulations, should be generally available for every social member and give appropriate support to vulnerable groups and undeveloped areas.

To sum up, we define inclusive financial system as a system which can include various forms of financing and provide financial services to a wide range of clients. Its clients cover all fields previously excluded by the traditional financial system, no matter they are disadvantaged or advantaged.

### **3.2 Characteristics of disadvantaged fields**

In this article, we refer to disadvantaged fields as which are in relatively low or weak positions. Although different disadvantaged fields are characterized by different features, they all cohere with the three characteristics—poverty, vulnerability and exclusion.

Poverty is the economic characteristic of disadvantaged fields. Poverty here means the scarcity of economic resources. Disadvantaged fields such as undeveloped regions, the poor and small business all reveal the poverty, which is the primary characteristic that determines the vulnerability and exclusion.

Vulnerability is the structural characteristic of disadvantaged fields. It indicates that the structure of disadvantaged fields is unstable and easy to be threatened by external shocks. For example, regional growth stops as resources exhausting and being polluted; the poor can't withstand the unpredictable shocks of disease or unemployment; small businesses face difficulties once the finance crisis happened.

Exclusion is the social characteristic of disadvantaged fields. It means that the disadvantaged fields are excluded from the formal social service systems which lead to the unfairness in sharing the social fruits. It refers to all kinds of exclusion, such as exclusion from the social security system, the healthcare system, the education system, the financial system and the legal system.

### **3.3 Role of inclusive financial system in supporting disadvantaged fields**

The disadvantaged fields have been marginalized because of the social exclusion. On one hand, disadvantaged fields are unable to obtain sufficient inputs of capital, technologies and human resources, but resulting in their outflow to the advantaged. On the other hand, gaps between the marginalized fields and others will lead the disadvantaged fields to “an isolated island” in the long-term.

Thus, inclusive financial system plays an irreplaceable role in supporting disadvantaged fields in these two ways: firstly, inclusive financial system can balance financial resources in different fields and allocate them to disadvantaged fields directly; secondly, the allocation of financial resources in disadvantaged fields can guide other economic resources to these fields and support them indirectly.

## **4 International Experience and Comparison**

### **4.1 International experience on inclusive financial system**

Based on the belief that the poor, especially women would be more credible than the rich, Grameen Bank in Bangladesh chooses the poor as their client and provides no collateral small loan. It formulates reasonable price of interest rates as a market player, initiating the group guarantee lending. In addition, it is legitimized and supported by the government. Grameen Bank not only solves the difficulties in lending to the poor but also some social problems, thus becomes a typical model of microfinance.

Regulated by Community Reinvestment Act, the community banks in America provide credits to their communities. They are regularly examined on their performance in low-and-moderate-income communities. The results will be references if the bank wants to open new businesses. However, such supervision is carried out differently according to the banks' scale. Compared with small banks, the large one will be examined strictly in its loans to disadvantaged communities.

Japan attaches great importance to support SMEs, and shapes an integrated financial supporting system, including policy finance, commercial finance and related regime support. Policy finance is implemented by government through establishing credit-guarantee institutions and insurance agencies. Commercial finance develops on the basis of policy finance and has become the main force in financial support for SMEs.

In general, international experience of microfinance can be summarized as follows: guided by the policy finance, promote the institution to be a differentiated market player, strengthen the structure of risk control system and promote the enactment of relevant laws and regulations.

### **4.2 Inclusive financial system in China and its future**

Though there has been much valuable experience already, we could not copy them without alteration, but building an inclusive financial system with Chinese characteristics for disadvantaged fields according to the special conditions and circumstances.

Firstly, with an imperfect market, we still have many restrictions in economy and finance development. Different from western countries who intend to innovate in products and services, China should reform the informal finance, promote financial market competition, broaden the access to encourage the participation of new-type financial institutions like rural bank and small loan company, and finally support disadvantaged fields in extent and depth.

Secondly, the coexistence of dual economic structure and dual financial structure is a fact we can't avoid. On one hand, it results in the multi-level of disadvantaged fields so that the different financial demands and backgrounds increase the difficulties in financial support. On the other hand, the formal

financial institutions, emphasizing on their own performance, always ignore the disadvantaged fields, while the informal financial institutions can't develop in scale without policy support and risk control. So, establishing an efficiently inclusive financial system that taking the interests of urban and rural areas both into consideration, and integrating the formal and informal financial institutions, is our future direction in disadvantaged fields supporting.

## 5 Structure and Function of Inclusive Financial System in China

### 5.1 Structure

As mentioned above, there are dualities of both economic and financial structure in China, so here we also consider the inclusive financial system in China as a dual one. The customers are divided into disadvantaged and advantaged fields, representing the duality of economy. The inclusive financial institutions consist of microfinance institutions (MFIs) and traditional finance institutions, showing the duality of finance. Disadvantaged fields, as what we have clarified previously, are served by MFIs. Advantaged fields, having relative comparative advantages to disadvantaged fields, are the target clients of traditional finance institutions. There is no absolute division between disadvantaged and advantaged fields, instead they are connected to each other, and so is the relationship between MFIs and traditional finance institutions. Here MFIs refer to savings banks, microcredit companies, micro-insurance companies etc. And traditional finance institutions are commercial banks, insurance companies, stock markets, venture capital, private equity, guarantee companies, financial leasing companies and so on.

In addition, financial information platform, financial regulatory departments, and supporting systems are also essential parts of the inclusive financial system. The financial information platform acts as an information collector. The financial regulatory departments consist of PBC, CBRC, CSRC, CIRC etc. The supporting systems include public finance departments, tax departments, etc. (Seeing Fig. 1)

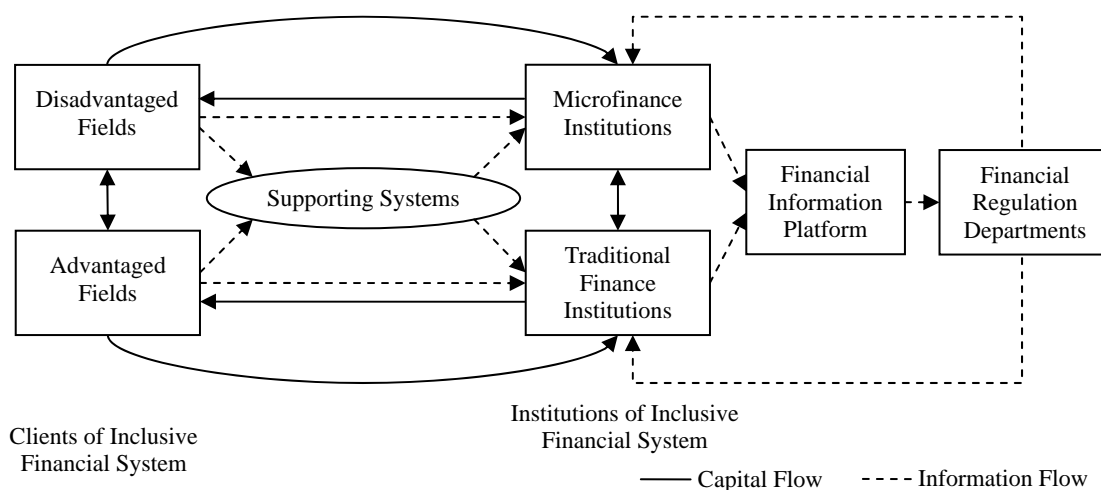


Figure 1 Inclusive Financial System in China

### 5.2 Function

Capital flows between disadvantaged fields and MFIs in the mode of taking deposits from disadvantaged fields, managing their small personal account management by the savings banks, providing small loans by the microcredit companies, supplying insurance services by the micro-insurance companies and so on. Large amount of capital flow links advantaged fields with traditional financial institutions through the indirect financing, equity investment, financial leasing etc. The inclusive financial system not only integrates the part of “disadvantaged fields and MFIs” into the system, but more importantly it interacts the flow between the parts of “the disadvantaged and MFIs” and “the advantaged and traditional” instead of flowing separately in their own part. The interactive capital flow between disadvantaged and advantaged fields takes the form of supply chain finance. And the capital flows in forms of wholesale loans between MFIs and traditional financial institutions.

Information flows in two ways. Clients provide their own information to financial institutions actively. Or the supporting systems get clients information from trade, tax declaration etc. and provide it to financial institutions indirectly which is passive but helpful to verify the authenticity of information. The function of financial information platform is to gather market information constituted of the active

and passive for financial regulation departments. The regulation departments act as the “Gatekeeper” not only for the purpose of market control, but also draw effective information through data filtering, statistics and analysis, and send it back to the market as an interaction between the government and market. Only in this way, the exchange and transmission of information can be efficient, being able to shorten the time lag of policy and strengthen the efficiency of market. The coordinated trans-information contributes to information sharing in different parts of the inclusive financial system.

## 6 Conclusions and Policy Recommendations

### 6.1 Integrating informal finance into the inclusive financial system

An inclusive financial system should include all kinds of financial services in demand, especially the diverse financial innovations and the informal finance. Recently, the prevalence of informal finance such as the “underground banks” has brought about quite a few undesirable phenomena. It shows that excluding the informal finance isn’t an effective way to achieve sustainable growth. But we should guide and regulate the informal finance in order to turn them into a powerful and sustainable force in the development of the financial system.

### 6.2 Coordinating all components through the appropriate allocation of financial resources

An inclusive financial system should coordinate all components of the system through the appropriate allocation of financial resources. Firstly, an inclusive financial system should try to seek the possibility of “Win-Win” instead of “Zero-Sum Game”. Secondly, a fair allocation between the various suppliers or the customers in the inclusive financial system can ensure the vitality of small-size financial institutions and the profits of the disadvantaged. So every component can become symbiotic in the whole inclusive financial system.

### 6.3 Adopting different patterns at different stages following the development cycle

The development of an inclusive financial system follows a life cycle, so that we should adopt different supporting patterns at different stages. At the early stage, public policies and public finance are the main support, and most institutions offer homogenous services to extend the range of financial inclusion, which can be defined as “inclusion in quantity”. At the second stage, we pay attention to the coordination and cooperation in and out of the system to achieve its self-adaptation, and provide individuality products to clients according to their different needs, known as “inclusion in quality”. In the long run, having the capacity to handle losses and gains on its own is the key to ensure the sustainable development of the system.

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## Modeling University Researchers' Behaviors: Academic and Applied Researches Balances

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**Abstract:** This paper suggests a theoretical framework for analyzing the behavior of academic researchers within the context of university-industry relationships and academic freedom. We assume that there are three following scenarios: 1) there is no supporting research fund for the researcher, 2) there is a supporting fund to use without any restrictions, and 3) the researcher has to seek for his own research fund through his applied research with firms in the industry. This paper, in particular, focuses on the first and second scenarios. Then it explores academic researchers' behaviors that optimize their utility functions, the satisfaction obtained by their research outputs. This paper characterizes these outputs as the results of researchers' 3C: Competence (the ability to implement the research), Commitment (the effort to do the research), and Contribution (finding meaning in the research). While most of the previous research utilized the empirical methods to study researcher's motivation to collaborate, the literature cannot develop a coherent insight of researcher's behavior without a supporting economic theory. To help fill this gap, we explore the interval factors formulating academic researcher's utility function, and examine how these factors affect individual motivation to collaborate. Our contribution is important both conceptually and practically because it provides the first theoretical framework to study the mechanism of researcher's behavior.

**Keyword:** ResearcherBehavior; Researcher's Utility; Academia-Industry

### 1 Introduction

In recent years, universities cultivated a strong capability to get involved in business and entrepreneurial activities. The assignment of university has dramatically changed: it has become more and more entrepreneurial (Siegel et al., 2007). Universities not only have to provide education and to be involved in research and knowledge production, but they also have to be involved in the commercialization endeavors of their scientific results. Accordingly, while university researchers, besides teaching, are expected to continue to think of original researches, they have come under increasing pressure to participate in the commercialization of academic research. This is the problem of balancing "academic freedom"<sup>1</sup> and "academic entrepreneurship". Understanding the individual motivational drivers for academia-industry relations is important for promoting the ultimate success or failure of this academia-industry collaboration.

Various studies have focused on what motivates academic researchers to engage in research commercialization. In contrast to researchers in the private sector, motivation of academic researchers partly stems from the concept "academic freedom". Accordingly, the intrinsic motivation of academics, unlike researchers in industry, is to value independence in choosing their research agenda rather than monetary rewards. In some cases, the decision to collaborate with industry is influenced by perceived threats to a researchers academic freedom (Tartari and Breschi, 2012). Although the main concern of academics is that industry involvement might restrict academic freedom, academics still express significant support for the collaboration with industry particularly when it is related to their research (Lee, 1996). Moreover, empirical findings in Looy et al. (2004, 2006); Wash (2009) suggest that the engagement in entrepreneurial activities coincides with increased outputs of research; activities in both do not hamper each other. Why does the collaboration have such controversial effects on the behavior of academic researchers? Literature indicated that there are some certain types of researchers suitable for the collaboration. D'Este and Perkmann (2010) found that although researchers in the UK engage with industry to further their research rather than to commercialize their knowledge, they have different

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<sup>1</sup> "Academic freedom" has two main components: freedom to conduct research ("academic choice": the ability to choose one's own research topics or choose their own research agendas), and freedom to communicate research (whether the scientist feels constraints in disclosing, communicating and sharing this research with others, i.e. the "norms of open science") (Behrens and Gray, 2001).

motivations to collaborate depending on the channels of engagement. Lam (2010, 2011) found the similar results. Davis et al. (2009) also found that scientists oriented towards basic research, and scientists who had previously worked in industry, were concerned that university patenting would negatively affect both aspects of academic freedom. Highly productive researchers, by contrast, were less apprehensive about either effect. The less productive basic researchers are especially worried about the effects on academics ability to choose their own research agendas. Scientists who had received research council grants, and full professors, are skeptical as regard to the effects on academic choice.

This exploration of researchers' motivation has attracted a growing interest in literature. Most of these studies have been conducted through data surveys among universities and their researching staff, or direct interviews with academic researchers. Then, conclusions and insights concerning researcher's individual motivation were drawn by analyzing the collected facts. In short, the current analytical method is an empirical method. However, despite having numerous studies, still less is known about the interaction as well as the mechanism between the various internal factors of the researchers (the intrinsic satisfaction, the improvement in research ability, the research effort, finding meaning in the research, career rewards, financial rewards, etc.) and their academic stances (preferences about academic freedom and academic entrepreneurship). The current analytical method has been challenged, and it needs to be complemented by a plausible theory. As far as we are aware of, this paper is the first to offer a theoretical framework to explore academic researchers' motivation within the context of university-industry relationships and academic freedom.

### Outline

Our paper is organized as follows. Our theoretical framework is described in Section 2. Dave Ulrich's 3C concepts and academic researcher's utility function form the focus of our analysis. Section 3 presents our research results and the implications.

## 2 Theoretical Model (Economics of Researchers)

To build a model of researcher behavior, the authors have evaluated several approaches. Among them, there are two popular thinkings in economics, that is, if considering the researcher as a knowledge producer, we will adopt a kind of production function of research into the model. This scheme will characterize the researcher as the one in industry. Alternatively, assuming that the researcher is a consumer who is enjoying his scientific outputs, we will construct utility function for the researcher. However, as shown by the following Table 1, due to the fundamental differences between university and industry researchers in the motivation of conducting scientific research, we adopted the utility approach in our paper. The intrinsic motivation of academics, unlike researchers in industry, is to value independence in choosing their research agenda more highly than monetary rewards.

**Table 1 Academic Entrepreneurial Differences (Jain et al., 2009)**

	Academic	Entrepreneurial
Norms	Universalism	Uniqueness
	Communism	Private property
	Disinterestedness	Passion
	Skepticism	Optimism
Processes	Experimentation	Focus
	Long-term orientation	Short-term orientation
	Individualistic/Small group	Team management
Outputs	Papers	Products
	Peer recognition/status	Profits

### 2.1 Ulrich 3Cs

Ulrich (2009) developed a concept called "3C" (Competence, Commitment, Contribution) to manage and evaluate the performance of human resource.

Competence is "the ability to do the work". Competence means that individuals have the knowledge, skills and values required for today's and tomorrow's jobs. Commitment is "the effort to do

the work”. Committed researchers work hard; put in their time. Contribution is “finding meaning ( or intrinsic motivation<sup>1</sup>) in their work”.

According to this 3C thinking, to give the best performance of a work, the man 1) not only has to possess an ability to do it such as skills or knowledge, 2) but also gives his best effort for the work (for example, working time), and 3) he must have an intrinsic motivation to do the work or finding meaning in the work he does. If any one of these three Cs is missing, the other two will not replace it. Highly competent researchers who are not committed or are not contributing in conducting research will give low performance on research outputs.

Dave Ulrich Model 3C = Competence x Commitment x Contribution

## 2.2 Formation of Utility Function

(1)Each academic researcher owns three resources - competence ( $C_1$ ), commitment ( $C_2$ ), and contribution ( $C_3$ ) defined as Ulrich's 3C - that are able to generate two types of knowledge-based outputs: academic output ( $X$ ) and commercial research output ( $Y$ ). The concepts “academic” or “commercial” are just relatively characterized by their potentiality of commercialization. They will be affected by various external factors surrounding the researcher. They will be determined according to the particular state of the researcher. Broadly speaking, one academic output resulted from a basic research originated by a researcher may be a commercial research output for others.

In the regards to the number of outputs that the researcher is able to generate, each of the two knowledge-based outputs  $X$  and  $Y$  should be also considered as one representative output for all producible academic and commercial outputs respectively.

The assumed relations between  $C_1, C_2, C_3$  and  $X, Y$  are described as follows:

- Competence ( $C_1$ ): the ability to do the work.

We assume that the competence  $C_1$  of a researcher comprises academic competence  $C_{1X}$  and profit-making competence  $C_{1Y}$ . Academic competence  $C_{1X}$  is a kind of competence concerning the basic research ability. It is assumed to be indispensable for generating academic output  $X$ . Similarly, profit-making competence  $C_{1Y}$  is indispensable for producing commercial output  $Y$ . Practically, it is difficult to make a clear distinction between  $C_{1X}$  and  $C_{1Y}$ .

Since the competence  $C_{1Y}$  is generally cumulated through the development of  $C_{1X}$ , we also assume that the competence  $C_{1Y} = g(C_{1X(0)})$  with  $g$  as a concave function and  $C_{1X(0)}$  is the antecedent academic competence.

- Commitment ( $C_2$ ): the effort to do the work. Here, there are two efforts in the respective to the outputs:  $C_{2X}$  - the effort for academic research  $X$ , and  $C_{2Y}$  - the effort for commercial research  $Y$ .

The effort  $C_2$  can be interpreted as the time spent on the activities. The total time for working varies within the researcher's disposal working time  $\overline{C_2}$ .

$$C_{2X} + C_{2Y} = \overline{C_2} \tag{1}$$

Generally, the limitation can be extended, for instance, when some part of the work is outsourced i.e. the effort can be purchasable if the researcher can access a fund. For the researcher, a favorable joint project will occupy his minimal effort but still leaves a considerable budget for him to use in academic research (for example, buying outsource effort for his own academic research). It also offers him useful hints (for example, scientific research topic) for his academic research.

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<sup>1</sup>Frey and Oberholzer-Gee (1997) p.746: Human behavior is influenced by both *extrinsic* and *intrinsic motivation*. The former is activated from the outside. In particular, individuals follow the generalized law of demand. Intrinsic motivations, on the other hand, relate to activities one simply undertakes because one likes to do them or because the individual derives some satisfaction from doing his or her duty.



Moreover, the competence  $C_1$ , in general, will grow over time through the endeavor  $C_2$  of the researcher. As a result, when there is no supporting research fund, with  $f(\cdot)$  as the voluntary training function, we describe the growth of the competence  $C_1$  as follows:

$$C_{1X} = C_{1X(0)} + f_X(C_{2X}) \tag{2}$$

$$C_{1Y} = g(C_{1Y(0)}) + f_Y(C_{2Y}) \tag{3}$$

- Contribution ( $C_3$ ): finding meaning (or intrinsic motivation) in the work we do.

Obviously, researchers are happy to contribute his scientific work towards the society with or even without financial reward. For example, it may be for the prestige, or is to satisfy his intellectual curiosity personally as well as the desire for doing good socially. It may be simply because he likes to do it. It is natural to demonstrate this intrinsic motivation as an increasing function  $\chi(\cdot)$  of the value<sup>1</sup> obtained from the research output  $X$  and  $Y$ .

$$C_{3Y} = \chi(X) \tag{4}$$

$$C_{3X} = \chi(Y) \tag{5}$$

It is logical to think that the intrinsic motivation  $C_3$  has a positive correlation with the respective effort  $C_2$ . As a result, when there is no supporting fund, with  $\theta(\cdot)$  as an increasing function, we can demonstrate them as follows:

$$C_{2X} = \theta(C_{3X}) \tag{6}$$

$$C_{2Y} = \theta(C_{3Y}) \tag{7}$$

The details of mathematical properties of competence  $C_1$ , commitment  $C_2$ , and contribution  $C_3$ , academic output  $X$ , commercial research output  $Y$  as well as  $C_{1X}, C_{1Y}, C_{2X}, C_{2Y}, C_{3X}, C_{3Y}$  are introduced in our full paper.

(2)The more the researcher generates  $X$  and  $Y$ , the more he feels satisfied, that is, the higher his utility<sup>2</sup>  $U$  of  $X$  and  $Y$  is.

The details of mathematical properties of the utility  $U(X, Y)$  are introduced in our full paper.

### 2.3 Mathematical Expression of the model

#### 2.3.1 Forms of academia-industry relations

There are various forms of relations between academia-industry (Table 2) as well as several types of research grants. As a result, the researcher is expected to adjust his behavior to optimize his utility depending on the combination of his collaboration forms and grant types.

**Table 2 Forms of Academia-Industry Relations (Link et al., 2007; Perkmann et al., 2011)**

Licensing	Contractual assignment of university-generated intellectual property (such as patents) to external organizations
Academic entrepreneurship	Development and commercial exploitation of

<sup>1</sup>For simplicity, we define the values of the research  $X$  and  $Y$  as  $X$  and  $Y$  respectively.

<sup>2</sup>We are aware that the economic concept of utility as generally applied today is *outcome-oriented*. As researcher's utility function is actually a function of  $C_3$  - finding the meanings of doing an activity, it also implies that the individual simply undertakes that activity because he likes to do it, or because he derives some satisfaction from doing his activity. Indeed, it is *preferences over actions* which is critically different from *preferences over outcomes* (Frey and Oberholzer-Gee, 1997; Frey et al., 2004). However, there are no problems in our paper owing to the fact that we define  $C_3$  as a function of the outcomes  $X$  and  $Y$ .

	technologies pursued by academic inventors
	through a company they (or partly) own
Collaborative research	Research jointly pursued by university and industrial partners commonly with public funding
Contract research	Application-oriented research and development activities carried out by university commissioned and funded by industry
Consulting	Application-oriented research and development activities or advice provided individually by academics commissioned and funded by industry

2.3.2 Effects of research grants

Public and industry funds have different impacts on research output: (Bozeman and Gaughan 2007) indicated that grants and contracts from industry have a significant effect on academic researchers propensity to work with industry. In turn, public grants also have an impact in increasing work with industry, but a more moderate scale. Grimpe (2012) studied six types of public and industry research grants in Germany and found that scientist productivity measured in terms of publication and patent stock is a statistically significant determinant only for obtaining foundation and industry grants while the award of an FP6 or government grant is influenced by other characteristics. Hottenrott and Thorwarth (2011) found some negative effects that a higher budget share from industry reduces publication output of professors both in terms of quantity and quality in subsequent years. However, industry fund has a positive impact on the quality of applied research if measured by patent citations.

2.3.3 Integrating industry research funds into the model

In this paper, since we are interested in the academic researcher's behavior towards the collaboration of academia-industry, public fund is temporarily excluded in the present setting.

Industry gives the researcher a research grant to obtain his commercial research output  $Y$ . Therefore, the grant amount is a function of the value of  $Y$ , that is,  $M(Y)$ . The researcher allocates the grant at will to increase his  $C_{1X}, C_{1Y}, C_{2X}, C_{2Y}$ . The allocation amount is  $M_{1X}, M_{1Y}, M_{2X}, M_{2Y}$  respectively.

The ultimate aim of an academic researcher is to optimize his utility function. He will choose his optimizing targeting levels of competence  $C_1$  and effort  $C_2$  by “purchasing” necessary amounts of them. For instance, the researcher can hire other competent researchers, or outsource the tedious task of inputting data.

The parameters  $\alpha_{1X}, \alpha_{1Y}, \beta_{2X}, \beta_{2Y}$  are the effect of one money unit on  $C_{1X}, C_{1Y}, C_{2X}, C_{2Y}$  respectively.

$$\max_{C_{1X}, C_{1Y}, C_{2X}, C_{2Y}} U(X(C_{1X}, C_{1Y}, C_{2X}, C_{3X}), Y(C_{1X}, C_{1Y}, C_{2Y}, C_{3Y})) \tag{8}$$

s.t.

$$C_{1X} = C_{1X(0)} + f_X(C_{2X}) + \alpha_{1X}M_{1X} \tag{9}$$

$$C_{1Y} = g(C_{1X(0)}) + f_Y(C_{2Y}) + \alpha_{1Y}M_{1Y} \tag{10}$$

$$C_{2X} = \theta(C_{3X}) + \beta_{2X}M_{2X} \tag{11}$$

$$C_{2Y} = \theta(C_{3Y}) + \beta_{2Y}M_{2Y} \tag{12}$$

$$C_{3X} = \chi(X) \tag{13}$$

$$C_{3Y} = \chi(Y) \tag{14}$$

$$\theta(C_{3X}) + \theta(C_{3Y}) = \overline{C}_2 \tag{15}$$

$$M(Y) = M_{1X} + M_{1Y} + M_{2X} + M_{2Y} \tag{16}$$

### 3 Analysis Results and Implications

For the simplicity, we will focus on two simple scenarios to examine our framework: 1) there is no supporting research fund for the researcher, 2) there is a supporting public grant to use without any restriction. The third scenario - the researcher has to seek for his own research fund through his applied research with firms in the industry - will be analyzed in our full paper.

#### 3.1 Case 1

There is no supporting research fund for the researcher

$$\max_{C_{1X}, C_{2X}} U(X(C_{1X}, C_{2X}, C_{3X})) \tag{17}$$

s.t.

$$C_{1X} = C_{1X(0)} + f_X(C_{2X}) \tag{18}$$

$$C_{2X} = \theta(C_{3X}) \leq \overline{C}_2 \tag{19}$$

$$C_{3X} = \chi(X) \tag{20}$$

Since  $U(\cdot)$  function,  $X(\cdot)$  function,  $\theta(\cdot)$  function and  $\chi(\cdot)$  function are increasing functions with respect to their own variables, it is easy to see that the optimizing solutions are as follows:

$$\begin{aligned} C_{2X}^* &= \overline{C}_2 \\ C_{3X}^* &= \theta^{-1}(\overline{C}_2) \\ C_{1X}^* &= C_{1X(0)} + f_X(\overline{C}_2) \end{aligned}$$

This is the simplest case. When there is no supporting fund, to optimize his utility, the researcher just conducts his work with all his effort.

#### 3.2 Case 2

There is a supporting fund to use without any restriction. The fund amount is  $\overline{M}$  (a fixed value).

$$\max_{C_{1X}, C_{2X}} U(X(C_{1X}, C_{2X}, C_{3X})) \tag{21}$$

s.t.

$$C_{1X} = C_{1X(0)} + f_X(C_{2X}) + \alpha_{1X} M_{1X} \tag{22}$$

$$C_{2X} = \theta(C_{3X}) + \beta_{2X} M_{2X} \tag{23}$$

$$C_{3X} = \chi(X) \tag{24}$$

$$\overline{M} = M_{1X} + M_{2X} \tag{25}$$

It is obvious that  $\theta(C_{3X})$  will equal to its maximum value  $\overline{C}_2$ . Like in the previous case, it implies that to optimize his utility, the necessary condition is that the researcher will carry out his work with all his effort. However, since there exists a supporting fund, how should the fund be allotted to make full use of it?

The Lagrangian equation  $L(C_{1X}, C_{2X}, \lambda)$  for this optimization problem is defined as

$$L = X(C_{1X}, C_{2X}, C_{3X}) + \lambda \left( \overline{M} - \frac{C_{1X} - (C_{1X(0)} + f_X)}{\alpha_{1X}} + \frac{C_{2X} - \overline{C}_2}{\beta_{2X}} \right) \tag{26}$$

The condition for optimization is as follows:

$$\frac{\partial X/\partial C_{2X}}{\partial X/\partial C_{1X}} = \left( \frac{\alpha_{1X}}{\beta_{2X}} - \frac{\partial f_X}{\partial C_{2X}} \right) \quad (27)$$

The left-hand side of the equation (27) is the economic rate of substitution between  $C_{1X}$  and  $C_{2X}$ .

Alternatively,

$$\frac{\alpha_{1X}}{\beta_{2X}} \frac{\partial X/\partial C_{1X}}{\partial X/\partial C_{2X}} = 1 + \frac{\partial f_X}{\partial C_{2X}} \frac{\partial X/\partial C_{1X}}{\partial X/\partial C_{2X}} \quad (28)$$

Notice that  $\alpha_{1X} \frac{\partial X}{\partial C_{1X}}$  and  $\beta_{2X} \frac{\partial X}{\partial C_{2X}}$  are the marginal research output of money spent on  $C_1$  and  $C_2$  respectively.

In most of cases, since  $\frac{\partial f_X}{\partial C_{2X}}$  is positive, it implies that at the state of optimization, comparing with the money spent on research effort, money spent on research competence gives a higher value of research output.  $f_X(C_{2X})$  is the voluntary training function that demonstrates the effect of the effort  $C_{2X}$  accounting for substantial changes (usually, the increase) in the competence  $C_{1X}$ .

Furthermore, making a comparative static analysis (introduced in our full paper) of  $M_{1X}(C_{1X}, f_X)$  and  $M_{2X}(C_{2X})$ , we found that if  $\frac{\partial f_X}{\partial C_{2X}}$  is low, researchers tend to increase money to “purchase” more research effort  $C_2$ . In contrast, more money will be allotted for “purchase” research competence  $C_1$  if  $\frac{\partial f_X}{\partial C_{2X}}$  is high.

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## Measuring Employee Satisfaction in SMEs Firms

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**Abstract:** It is an obvious statement that high employee satisfaction can reduce employee turnover. Dissatisfied employees tend to perform below their capabilities. To know this in a scientific way we need to have a tool to measure employee satisfaction based on certain factors. For this reason in this paper I developed an original measuring tool based on five independent and another five dependent factors using logical mathematical concepts. Thus according to the investigation of the research Employees Satisfaction is equal to Employees Expectation minus Employees Perception and divided by summation of value of independent factors. It symbolize as  $EP - PR / \sum n (V)$ . The purpose of the research is to contribute to academic researchers as well as businesses, about how to measure the employee satisfaction in order to see what sort of human resource management skill is needed to maximize the mental satisfaction of the employees and profit as well.

**Key Words:** SMEs, Employee Satisfaction, Employee Perception, Employee Expectation

### I Introduction

It has been argued that there is a positive relationship between firm performance (usually measured by quality and efficiency) and key human resource practices (Rodwell *et al.*, 2000). More specifically, the human resource practices of incentive pay, employee training and development, recruitment and selection, compensation, industrial relations, and performance appraisals have been identified as best practices that are positively correlated to lower employee turnover, greater employee productivity and better overall firm performance (Huselid, 1995). For this effective organization is needed.

Effective organizations should have a culture that encourages the employee satisfaction (Bhatti & Qureshi, 2007). Employees are more loyal and productive when they are satisfied (Hunter & Tietyen, 1997), and these satisfied employees affect the customer satisfaction and organisational productivity (Potterfield, 1999). Employee satisfaction is defined as the combination of affective reactions to the differential perceptions of what he/she wants to receive compared with what he/she actually receives (Cranny, Smith, & Stone, 1992). This forces the managers to create and sustain the desired working environments in the organizations. One the other hand the employee satisfaction is one of the basics of organisational citizenship behavior (Ozdevecioglu, 2000). That is, the well-satisfied employees will work more willingly and this contributes to the effectiveness of their organizations.

There is no limit for the employees to reach the full satisfaction and it may vary from employee to employee. Sometimes they need to change their behaviors in order to execute their duties more effectively to gain greater job satisfaction (Miller, 2006). Employee satisfaction is perhaps the most frequently studied construct in the organisational sciences (Schneider and Brief, 1992). Employee satisfaction (often referred to as job satisfaction) has been defined as “a pleasurable or positive emotional state resulting from the appraisal of ones job or job experiences” (Locke, 1976).

The purpose of this research is to develop new measuring tool to measure Employees Satisfaction. Also it has the following significance: It is essential to facilitating development and organisational change, allows the organization to focus on needs and leverage its strengths, informs the organization on which actions will create problems for the employees, provides management with employee feedback (both positive and negative) on the internal health of the organization, measures the impact of current programs, policies and procedures and can be used to motivate employees and improve job satisfaction

### 2 Gap on Other Research Works

Traditional employee satisfaction measurement methods are mostly perception-based; that is they usually ask questions such as “all things considered, how satisfied are you with indicator x regarding your job?” without asking about “how important that indicator is to you?” The latter question can clarify the opinions or expectations of the employee toward the indicator. In such cases, unless people indicate severely low satisfaction levels, it is hard to provide specific managerial direction from the results.

Many researchers have different research on employee satisfaction. For example Nejatia., Nejatib, Shafaic (2007) in their research they try to measure employee satisfaction based on SERVQUAL method. The purpose of their study is to measure employee satisfaction and determine the existing gap

between employees' expectation and perception of their working condition. Items on the questionnaire represented various job condition aspects. Each aspect was concisely repeated in two statements: one to measure expectations and the other to measure perception about job condition, following the method used by Parasuraman et al. (1988). These aspects fell in the five dimensions of SERVQUAL model including Tangibles, Reliability, Responsiveness, Assurance, and Empathy. A five-point Likert scale ranging from very good to very bad was used to measure each of the indicators. (Very Bad = 1, Bad = 2, Fair = 3, Good = 4, Very Good = 5).

Thus, this paper uses another five independent and another five dependent factors in order to measure employee satisfaction. The independent factors are Employees Treatment, Regular Employee Recognition, Employees Empowerment, Employees Benefits and Compensation, and Effective Management. This observed in the research from employees expectation and perception perspectives.

### 3 Determinates of Employee Satisfaction and New Measuring Theory

Factors contributing to employee satisfaction include treating employees with respect, providing regular employee recognition, empowering employees, offering above industry-average benefits and compensation, providing employee perks and company activities, and positive management within a success framework of goals, measurements, and expectations.

In this research the basic idea laid on Employees Satisfaction = Employees Expectation in SMEs Firm

$$- \text{Employees Perception in SMEs Firm}$$

$$\text{I.e. } ES = EP - PR$$

$$\sum n (V) \text{ (i.e. summation of number of variables)}$$

So to reach on this logical mathematical equation we need to find the dependent and the independent factors or Variables clearly. Thus this paper suggested the following five key factors as a base line to measure employee satisfaction in any organization (See Table 1 below).

**Table 1 Independent Variables: Employees expectation**

<i>Independent Factors</i>	<i>Symbols</i>	<b>Value of Factors</b>
Employees Treatment	ET	1
Regular Employee Recognition	RER	2
Employees Empowerment,	EE	3
Employees Benefits and Compensation	EBC	4
Effective Management	EF	5
<b><math>\sum n (V)</math></b>		<b>15</b>

Thus, Employees Expectation within the Organization is equal to:

$$(EP) = (ET + RER + EE + EBC + EF)$$

When we see the dependent variables, we will find the following factors which extracted from the independent one (See Table 2 below).

**Table 2 Dependent Variables from Employees perception**

<i>Dependent Factors</i>	<b>Symbols</b>
P. Treatment	PT
P. Regular Recognition	PRR
P. Empowerment,	PE
P. Benefits and Compensation	PBC
<b>P. Effective Management</b>	<b>PEF</b>

Where P = Perception

Thus, Employees Perception within the Organization is equal to:

$$(PR) = (PT + PRR + PE PBC + PEF)$$

Therefore, Employees Satisfaction is equal to:

$$ES = \frac{(EP) - (PR)}{\sum n (V)}$$

$$ES = \frac{[ET + RER + EE + EBC + EF] - [PT + PRR + PE + PBC + PEF]}{\Sigma n(V)}$$

Where “ES” referees ‘ Employee Satisfaction’,  $\Sigma n(V)$  referees summation of the number of members of the factors: Employees Treatment(1), Regular Employee Recognition(2), Employees Empowerment(3), Employees Benefits and Compensation(4), Effective Management(5) i.e. [V1 +V2 + V3 =V4 +V5]...{1 +2 +3 + 4 +5 = 15}. Also in the above formula (EP) referees Employee Expectation within the organization and (PR) referee Employee Perception within the organization.

#### 4 Measuring Method, Examples

To apply this new measuring tools we need to have we need to follow the following measuring skills. Primary the questionnaire will distribute to the respected respondents. The questionnaire based on the independent and the dependent factors thorough three key measuring scales: Strongly Agree (has value 3), Agree (has value 2) and Disagree (has 1 value) (See the Table 3 below).

**Table 3 Examples on How to Calculate Employee Expectation (EP)**

Independent Factors	Symbols	Measuring Scales		
		Strongly Agree (3)	Agree (2)	Disagree (1)
Employees Treatment	ET	X		
Regular Employee Recognition	RER		X	
Employees Empowerment,	EE	X		
Employees Benefits and Compensation	EBC	X		
Effective Management	EF	X		

Based on the above sample data we can calculate the Employee Expectation within the organization (EP). Thus here ET = 3, RER = 2, EE = 3, EBC = 3, and EF = 3.

$$\text{Therefore, (EP) = (ET + RER + EE + EBC + EF)}$$

$$\text{I.e. EP = 3 + 2 + 3 + 3 + 3 = 14}$$

Like Employee Expectation, to calculate Employee Perception (the other dependent factors) we have to take some assumptions as well. The following table (Table 4) shows how to do that.

**Table 4 Examples on How to Calculate Employee Perception (PR)**

Dependent Factors	Symbols	Measuring Scales		
		Strongly Agree (3)	Agree (2)	Disagree (1)
P. Treatment	PT		X	
P. Regular Recognition	PRR		X	
P. Empowerment,	PE			X
P. Benefits and Compensation	PBC	X		
P. Effective Management	PEF		X	

Based on the above sample data we can calculate the Employee Perception within the organization (PR). Thus here PT = 2, PRR = 2, PE = 1, PBC = 3, and PEF = 2. Thus, the basic formula is:

$$PR = (PT + PRR + PE + PBC + PEF)$$

$$\text{I.e. PR = 2 + 2 + 1 + 3 + 2 = 10}$$

Therefore,

$$\text{Employees Satisfaction = Employees Expectation} \\ \text{Minus}$$

$$\text{Employees Perception within the Organization}$$

Having this new formula when we calculate the above sample i.e. EP = 14, PR = 10, and  $\Sigma n(V)$  = 15, we can find the following result. Below the result [0. 266] shows employees are satisfied within the sample organization.

$$\text{i.e. } ES = \frac{EP - PR}{\Sigma n(V)} = \frac{14 - 10}{15} = \frac{4}{15} = 0.266$$

#### 5 Result Description



In this research after we calculating the Employee Satisfaction based on the new formula  $(EP - PR) / \sum n (V)$  we will get result  $(-\infty, \infty)$ . This indicates that if the expectation of the Employees is equal to 15 (maximum value) and if Employees Perception (actual observation) is equal to 15 as well it means the difference will be zero. And by the formula we will divided this by 15. Then the result would be 0. In this research this result considered as Employees are satisfied in the organization. But if Expectation grater than the perception the result would be positive no. And this considered as Employees are not satisfied. On the other hand if Perception grater than Expectation, then the result would be negative no. And this Employees are highly satisfied (See Figure 1 below).

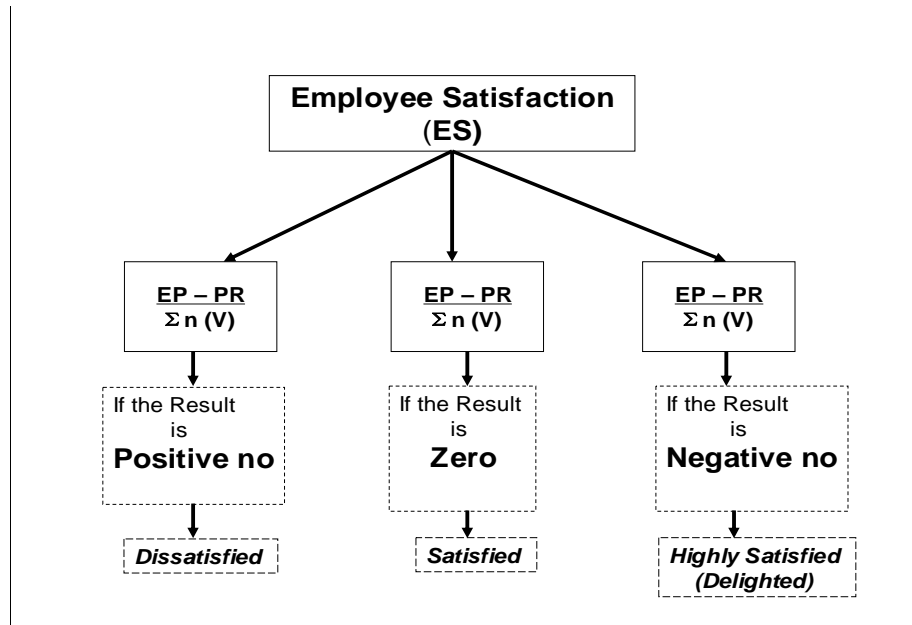


Figure 1 Result Description

## 6 Conclusion

As any effective organisational strategy designing an employee satisfaction survey with in a specific period in any SMEs firm should be considered as a basic task. This is true just because it has direct or indirect impact to see better performance and profit within the specific firm. To implement the survey and to do report on the results there must be universal measuring tool but it would not be easy to get that with in one night. Therefore different researchers keep on working on it. This research is one of the contributions for the future findings. I do believe that it will give at least a hint on the research of the area.

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# Research of the Transportation Humanization Development

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**Abstract:** The extensive connection between transportation and society is decided by transportation characteristics. The author considers that modern service must based on the full respect of people's interests and feelings, and attain the humanization service. Talking about the people-oriented generally is not enough. The author puts forward that on the basis of the "people-oriented" concept cultivating and the improvement of quality of transport industry practitioners, perfecting market structure, saving time, making the information unobstructed and using modern means of managements, all of these are details, as well as the necessary choice.

**Key words:** Transportation; Humanization; Service

## 1 Introduction

The transportation industry is an important segment of social reproduction with a multiple links and process. There are many types of joint operation processes: with mobility, network, intangible property, dispersive property, and service etc. The unity of transportation, production and consumption decide the unity of business economic benefits of establishment, and social benefits, which determines the different requirements of management between transportation industry and other industries as well. With the accelerating modernization transportation industry; it has become an important problem to be solved about how to achieve the modernization of transportation management, ensure the stable transportation development and create the best economic and social benefits, and researches in these ways are relative lack.

"People-oriented" has been put in the first place of the policies that puts forward in the highway waterway traffic science and technology development strategy of China. That is to say, "In order to people" and "rely on people" is determined for traffic science and technology development goals. In the background of constructing the harmonious society and harmonious traffic, the modernization of the transportation industry can't lose the connotation of the humanization; modern management must be humanized management. The problems of guiding ideology, management ideas, and ways and means of humanization of modern transportation management still need to be studied.

## 2 Establishing Humanized Guiding Ideology

Advanced thought gestate the advanced management, Management theory and practice are certain ideological embodiment. In the modern era, transportation management guide ideology of the core and the reflection in the "people-oriented" concept, to set the humanized guiding ideology.

### 2.1 Service concept

Service is one of the important characteristics in the transportation industry. Highlight the "people-oriented", implement people-centered humanistic management, respects the human, understanding, caring person as an important part of management, customer interests as the starting point and standpoint of all work, to improve the competitiveness of enterprises is an important measure. The high speed development of transportation industry and the fierce competition of the passenger and freight market, cause the kaleidoscopic change of passenger flow and cargo flow, meanwhile, management means from the management to a service transformation. With the diversification of transport machine, the goods or passengers have more options, transport market gradually from the seller market to the buyer's market. Researching the markets, adapting to markets development, building the markets, and providing the humanized management will become important issue of transportation enterprise to build competitive edge. It will be the inherent requirement of constructing the harmonious traffic as well. Transportation enterprise should firmly establish "Customer Oriented" thought and respect customer. It shows the consideration of the client and provide the personalized service to the customers with their hearts, from every tiny place to let them feel the warmth. This kind of humanization of the guidelines and service concept benefit to the enterprise to constantly improve the service method, improve the service level, enhance the service idea, so as to better achieve management modernization.

### 2.2 Concept of talent

To realize the modernization of the transportation management, it cannot leave the talents, the human resources is the capital of enterprise development; establish the concept of talent firmly is the guarantee of realizing modernization management of a powerful. From the "people-oriented" angle, transportation enterprise in the process of modernization, it can't simply understanding for the application of advanced science or modern tools of technology, but put more energy to the improve the quality of the personnel while improving production technology level. The transportation industry more deals with clients which is the people, the first impression the customers get of the enterprise is from their service. Therefore, improving the quality of the team, and building knowledge, quality, intelligence, skill and talented team is helpful to improve enterprise image. Therefore, the enterprise must strengthen the employees on "people-oriented" consciousness and service skills, let employees serve the customer warm, patient, and with high quality, so that customers are always feeling comfortable and convenient, then becoming the satisfaction and loyal customer base of enterprise.

### 3 Establish Humanized Management Concept

In the process of constructing the modern transportation management system, it shall be according to the humanization guiding ideology, establishing human-oriented management ideas, which include the humanized market ideas, the concept of time and information idea.

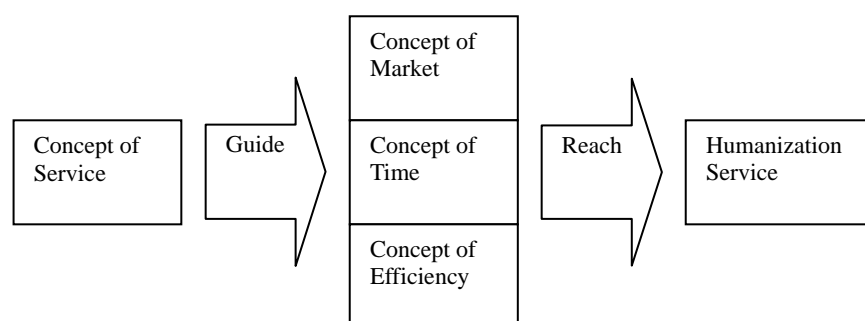


Figure 1 Idea Contributes to Humanized Service

#### 3.1 The market conception

Transport market is a special type of commodity markets; the market is one important basic condition of transportation production and business operation activities. For the transportation industry, people-oriented, customer is the highest concept, which is the humanized market idea. The transport enterprises must face the market and focus on the market, in line with the ideas of the customer service and the immediate interests that the customer cares about, adapting to the market demand from the dint structure, management structure, price, and service quality. Often listen to customers' opinions, discovering the potential requirements of customers, improving management, provide cheap, timely, convenient and safe, comfortable, civilization and humane transportation service. Win the reputation and popularity, obtaining a faster, better development of the enterprise.

#### 3.2 The concept of time

Time is a special kind of resources, with the progress of modern science and technology, the value of time is more obvious, the high and low of the efficiency is also becoming one of important factors that reflect the modern management level of transportation enterprise. On the one hand, transport enterprise must improve the hardware conditions, optimize management structure, perfect management mode and realize the standardization, so as to improve the work efficiency of the enterprise. On the other hand, transport enterprises have to improve the concept of time up to enterprise leadership, down to the ordinary employees, the management decision should be rapidly, and the service methods should be flexible. Specific humanization concept of time is reflected in two aspects, one is in the transport of goods, we should know the benefits of the owner, respect the owner and perform the contract of carriage, completed the transportation tasks quick and safely, guarantee the owner's interests; Second is in the passenger, we should know the interests of the passengers, care about passengers, complete transportation safety and timely, save the time costs of passengers, reduce the consumption of the body and mind of passengers.

#### 3.3 Information idea

Information is a kind of special resource, is the essential factor for enterprise to planning and control, and it is an important basis for effectively decision-making, the higher the quality of the

information goes the higher quality of making the decisions, and the higher the level of service will rich. Humanization information concept requires transport enterprise to establish advanced and sensitive information service system that rely on high quality staff from the organization analyze the inside and outside information flows, and collect, arrangement, screening and treatment, the transmission all kinds of information in the transport market, and make scientific decisions; Also the transportation enterprises were asked to provide accurate and fast information services which depend on effective channels to the customers , convenient for them to choose and decision making, reduce their time and economic cost in choice.

#### 4 The Humanized Management Mode

Transportation enterprise management must adapt to the nature and task of transport industry, putting the improvement of the social efficiency and the economic efficiency as a starting point, taking the market as the guidance, according to the principle of systematic, integrity, dealing with the relationship between centralization and decentralization, division of labor and cooperation. In the process of implementation of the management, the internal staff should be given more humanistic concern, to make them better customer service, better reflect the humanity of service.

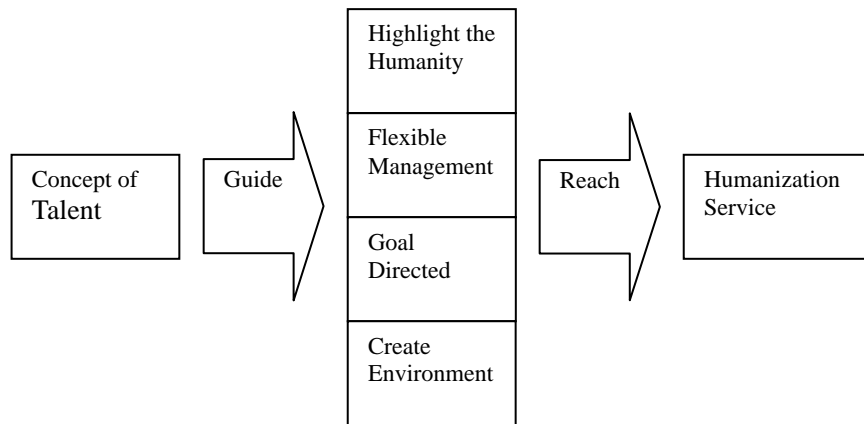


Figure 2 Fashion Contributes to Humanized Service

##### 4.1 Prominent humanity requirements

Only make principle requires and the characteristics of humanization demand agree and make humanized manifest, management can get fundamental improvement and continued to play. At the core of the problem, is from the demand point of view, to give employees respect and understanding, and create a fair competition mechanism, build, produce, development space and platform.

##### 4.2 Implement flexible management

Flexible management is to create a dynamic and flexible working environment, motivate intrinsic vitality and dynamism of employees, forming an elastic operation team spirit organization. Humanization is the existence of positive factors, but also contains inert is objective and actual; management should pay attention to stimulate the positive aspects of humanization, suppression of negative aspects. Has been formed in good earnest responsible overall environment and mechanism, to give people a greater tolerance, guide, help employee progress and promotion as the administrative centre of gravity, to give employees play the maximum space, avoid overly rigid management to the management object to cause heart injury and material damage.

##### 4.3 The right idea guidance

If there is no proper management policy to guide staff, the final result will be in vain. To reach the humanized management, must by the leader of the enterprise dedicated to a positive attitude to the leadership of the staff, so that employees can feel the meaning of work, burst of automatic driving force, and actively understand the company's overall goals and objectives, in order to achieve the goal of enterprise and diligently.

##### 4.4 Create a humane environment

The leader of the enterprise should pay attention to the big environment and the small details on the embodiment of humane spirit, in competing, these and other issues, to respect the individual will and choice; in landscape, recreational facilities, office condition should be necessary investment, to create a

suitable for people living, working, fighting environment and atmosphere, and promote the work of passion.

## 5 The Implementation of Humane Management Tools

Management means of humanity is refers in the transportation management process, through the use of modern advanced science and technology; accelerate the process of modernization of whole industry, to protect the interests of all the parties in traffic transportation, particularly a better realization of the protection of interests, it would be better to achieve the demands of humanization.

At the beginning of the 1990's, Chinese scholars began to pay attention to the development of intelligent transportation system. After 1995, Chinese intelligent transportation system start to research, test and international exchanges which has become increasingly frequent, Chinese Ministry of transportation intelligent transportation systems is included in the medium and long-term planning, transportation industry in China, ITS, VTS and other intelligent systems have great influence.

### 5.1 Intelligent transportation system (ITS)

ITS is an advanced information technology, communication technology, electronic control technology, artificial intelligence and other subjects used for transportation, thus forming a kind of timing, accurate and efficient integrated transport system. With the development of science and technology, the idea of ITS has been gradually introduced into the highway, railway, aviation and other fields, in recent years, with the development of inland river shipping. As a result of advanced traffic information system for travelers to provide a strong information support, to provide the best route and real-time navigation information for travelers, it plays a very important role of guidance, greatly facilitate the travel; advanced public transportation system using computer technology to transportation and public facilities and technical conditions and the level of service for real-time analysis traffic system plan, implementation, operation and management functions of the automation, provide passengers with real-time public transport information and transfer information. Therefore, intelligent transportation systems gradually mature for transportation enterprises to better achieve the humanized management.

### 5.2 Vessel traffic management systems (VTS)

VTS is a set of navigation technology, computer network technology, information processing technology and navigation technology as one of the traffic management system, its purpose is to enhance the safety of navigation and increase transport efficiency, the maximum guarantee the security of the person. VTS can be realized on the waters for traffic surveillance specification ship behavior, prevention of traffic accidents. Statistics show that, because of the establishment of it, the traffic accident is reduced to 1/3, 1/5, therefore, it can be greatly reduced by the accidents caused by the loss of life and property and possible environmental pollution. On the other hand, it will contribute to reduce shipping obstruction and time delays, increase transport efficiency, saving the people's travel time. Visible, the application of VTS to realize the modernization of transport management plays an important role, many of its functions and services also embodies the human side, which has great social and economic benefits.

With the ITS, VTS and other advanced technology and the continuous development of Chinese domestic transport infrastructure is perfected further, traffic industry will be able to pass these advanced technical means to improve transportation efficiency, ensure the traffic safety, improve the quality of the environment, and raise energy utilization rate. It will achieves the humanized management, and promote the harmonious development of traffic.

## 6 Conclusions

As China has entered into the twenty-first Century, humanized development is becoming the inevitable requirement of the transportation industry .The customer as a transportation service object is appear in human form at first, customer requirements are comprehensive and meticulous service, both the quality and the efficiency, also including friendly treatment. To the modern Chinese transportation industry, the very urgent task is to be in ideology establish and humanized service related concepts, including the concept of service, talent idea, market-in concept, the concept of time, the efficiency of the concept, and these ideas into the operator and the conscious acts of employees. For managers, to reflect humanized management mode and technology application is extremely important to guide and protect, it is the goal that I write this article and it is an important direction for enterprise development as well. With the society pay more attention to the people problems, research in this area will be more thinning.

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## Individual Characteristics and Their Influence on Innovation: A Literature Review

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**Abstract:** Innovation is widely acknowledged nowadays as the source for firms' competitive advantage. Whereas previous innovation research mainly focus on the group and organisational levels, only a relatively small number of studies cover individual perspectives on innovation performance. Based on a systematic literature review, we provide a comprehensive framework, identifying individual characteristics that impact innovation at individual, team and firm levels. We also distinguish between various types of innovation (i.e., technological innovation, product innovation, process innovation) and consider variables that mediate or moderate the relationship between individual characteristics and innovation performance. Gaps are highlighted and future research directions are formulated.

**Keywords:** Individual characteristics; Innovative behaviour; Process innovation; Product innovation; Technological innovation

### 1 Introduction

Organisations increasingly consider innovation also as their main source for competitive advantage (Tushman & O'Reilly, 1996). When it comes to understanding and explaining innovation performance, previous research (e.g. Crossan, Lane, & White, 1999; Damanpour, 1991; West & Anderson, 1996) has mainly focused on the organisational and group levels of analysis. Although individuals are cited as a critical component of innovation processes, a relatively small number of studies cover individual perspectives upon innovation performance (Ahuja, Lampert, & Tandon, 2008; Crossan, Lane, & White, 1999). This study aims to provide a systematic overview of existing research on the relationship between individual characteristics and innovation. Our study deviates from previous literature studies (i.e., Anderson et al., 2004), which considered the innovation implications of individual characteristics, in two important ways. First, in our study, we make an explicit distinction between different levels of innovation outcomes (i.e., individual, team and firm level of analysis). Second, we conceptualize innovation as a multi-dimensional phenomenon, examining the impact of individual characteristics on different types of innovation (i.e., technological, product and process innovation). Finally, we explicitly consider the essential role of moderators and mediators on the relationship between individual characteristics and innovation.

Taking a multi-level perspective upon innovation is important as it might contribute to a more integrated understanding of the innovation that unfolds across levels in organizations (Klein & Koslowski, 2000; Sears & Baba, 2011). Sears and Baba (2011), for instance, indicate that a multi-level perspective might recognize that an individual's aptitude for innovation is strengthened by team diversity which might be further supported, at the organisational level, by managerial professionalism and a greater absorptive capacity. Secondly, focusing on different types of innovation sheds light on the complexity of managing innovation, as different types of innovation require different focuses and different management strategies. Kimberly and Evanisko (1981) show, for instance, that individual characteristics of hospital administrators such as educational level, cosmopolitanism, tenure are positively related to administrative innovation but not to technological innovation. By highlighting the role of moderators and mediators on the relationship under investigation contributes to a more holistic outlook on innovation. This is essential as, for instance, (Zhou & George, 2001) showed that feedback valence (i.e., the extent to which the feedback is positive or negative) and supervisors' monitored behaviour influence the extent to which individuals exert (more) innovative behaviour.

This literature review seeks to advance innovation research in three fundamental ways. Firstly, our purpose is to identify the empirical relationships between individuals' characteristics and innovation performance on different levels of analysis. This purpose is meant to construct a synthesis, based on a systematic evaluation of the literature, of the available research and to provide a list of individual enablers of innovation performance. Secondly, our aim is to discover to what extent existing research has identified differential effects of individual characteristics on different types of innovation. Thirdly, we aim to provide a more comprehensive overview on the relationship between individual



characteristics and innovation by taking into consideration the role of the moderators and mediators.

The remainder of this paper is structured as follows. First, we describe the methodology that is used to conduct the systematic literature review. Second, by making an explicit distinction between individual, team and firm level of analysis, we present the results of the impact of individual characteristics on (different types of) innovation. Finally, by assessing and connecting the insights from the literature review, we analyse and discuss the findings, suggesting also interesting avenues for future research.

## 2 Methodology

For this literature review we used a systematic approach when selecting the relevant articles in order to remove the subjectivity of the data collection (Crossan, Lane, & White, 1999; Webster & Watson, 2002). Using a predefined selection algorithm and following specific procedures (Crossan, Lane, & White, 1999; Webster & Watson, 2002; Tranfield, Denyer, & Smart, 2003), this literature review was conducted in several stages which are fully described in the next lines.

The *first stage* was to identify relevant articles for inclusion in the literature review and we used ISI Web of Knowledge database as it is one of the most comprehensive databases of peer-reviewed journals (Crossan & Apaydin, 2010). Our attention revolved around those articles that addressed the aim of our literature review (i.e., how individual characteristics impact innovation), having in mind also different levels of analysis and types of innovation. Specifically, articles were selected if they addressed how individual characteristics impact *individual* innovation (i.e., innovative behaviour), *team* and *firm* innovation. We conducted keyword searches, by title, based on which a large number of articles surfaced. Essential to mention is that the keyword searches (e.g., “individual and innovation”; “motivation and innovation”; “personality and innovation”; “individual creativity and technological innovation”; “personality and product innovation” etc.) were conducted for each independent and dependent variable to increase the probability of including the most relevant articles and of conducting a complete literature review. In the light of the same reason, we applied another criterion (i.e., by subject area) and further refined the initial total number of articles by selecting specific subject areas such as business economics, psychology, behavioural sciences, sociology and operations research management science. The search procedure resulted in a total number of 276 articles.

In the *second stage*, we assessed the relevance of the articles based on title and abstract and included (a) studies that were related to innovation at all the already mentioned levels of analysis; (b) empirical studies as they bring insights to better understand the relationship under investigation (at all levels of analysis); (c) studies in which creativity was a dependent variable – this is an interesting search outcome as in the procedure for the keyword searches, creativity was not used as a keyword. On the other hand, we did not include (a) studies related to innovation adoption; (b) studies where organisational innovation was a dependent variable (when this variable was measured as product and/or process innovation, the studies were included and coded either for the product or process innovation); (c) studies that were looking at the individual characteristics in online environments.

In the *third stage*, to ensure a more accurate selection of the relevant articles we made an in-depth assessment of both the abstract and the content of the selected articles. We also reviewed the references of these articles which gave us the possibility to include some additional relevant ones. After this stage, the sample was considerably trimmed down to a total number of 40 articles for our literature review: 22 articles – Figure 1; 5 articles – Figure 2; 13 articles – Figure 3.

In the *fourth stage*, the final one, we thoroughly read the articles and created an outline that painted the content of the relevant articles in terms of (a) the data sources (i.e., title, authors, article source, publication date), (b) the independent and dependent variables and their operationalization, (c) the methodology - research design/approach, (d) the supported hypotheses and, (e) the findings of each study. Subsequently, based on this information we created conceptual frameworks (Figure 1, Figure 2 and Figure 3) to illustrate the existent relationships between individual characteristics and innovation throughout empirical research.

## 3 Impact of Individual Characteristics on Individual Innovation

Based on the reviewed literature, this section first defines the relevant concepts and provides the categorization procedure based on which individual characteristics were clustered according to relevant social-personality theories. Second, applying a concept-centric approach (Webster & Watson, 2002), we present the main findings of existing literature on the relationships between individual characteristics and innovative behaviour (Figure 1), making an explicit distinction between direct, mediating, and

moderating relationships.

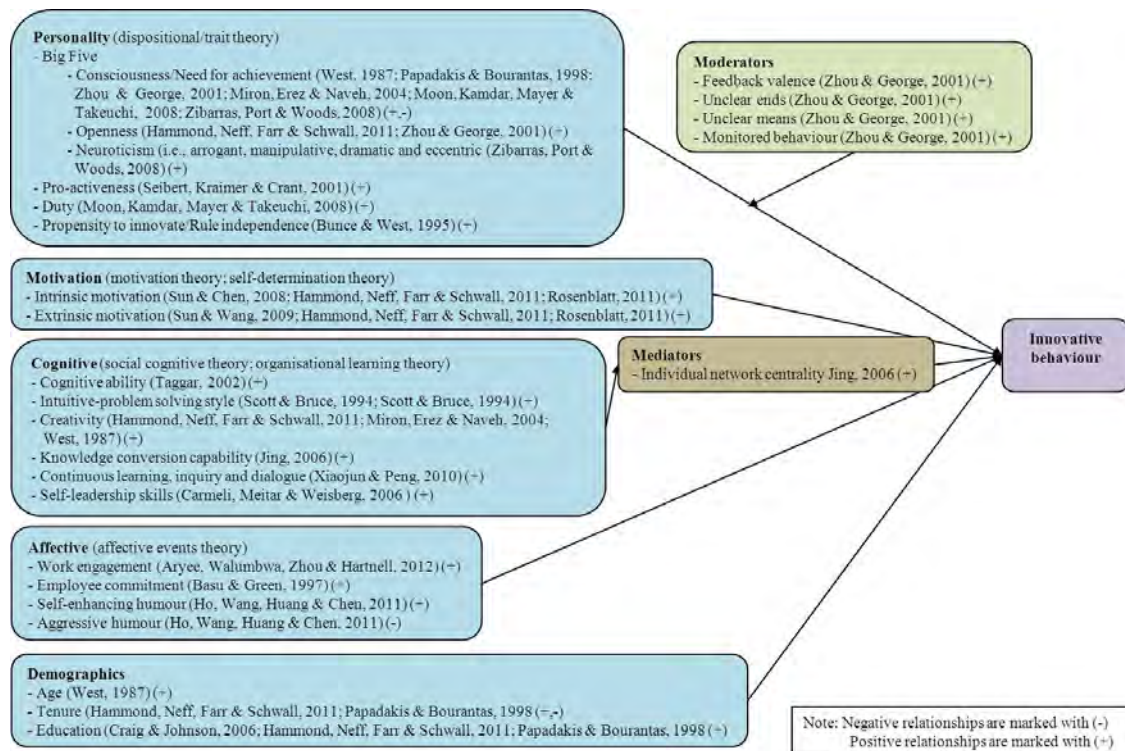


Figure 1 Individual Characteristics and Their Influence on Innovative Behaviour

### 3.1 Definition and categorization

The reviewing process of the selected articles provided us with a large number of individual characteristics, which theoretically belong to various subfields of psychology. In order to classify them, we first chose to refer to an overarching perspective offered by a single distinct area of psychology: social-personality psychology<sup>1</sup> (Tracy, Robins, & Sherman, 2009). Secondly, by making use of the social-personality theories (i.e., trait theory, motivation theory, self-determination theory, social cognitive theory, organisational learning theory and affective events theory) we classified individual characteristics into five main categories: *personality*, *motivation*, *cognitive*, *affective* and *demographics*. Within the reviewed literature, the measures of innovative behaviour pointed both to innovative and creative behaviour. Following Seibert, Kraimer, and Crant (2001: 851), we therefore define innovative behaviour<sup>2</sup> in terms of coming up with new ideas and working to implement them.

### 3.2 Findings

#### 3.2.1 Personality

Many reviewed articles (e.g., Hammond, Neff, Farr, Schwall, & Zhao, 2011; Miron, Erez, & Naveh, 2004; Moon, Kamdar, Mayer, & Takeuchi, 2008; Papadakis & Bourantas, 1998; Zhou & George, 2001) focused on *personality*-related concepts that impact innovative behaviour. According to dispositional theory, personality trait is seen as a “neurophysic structure having the capacity to render many stimuli functionally equivalent and to initiate and guide equivalent forms of adaptive and expressive behaviour” (Allport, 1961: 347).

One of the most widely accepted model of personality, the Big Five factor model, includes “Neuroticism (i.e., tendency to experience negative affects, such as fear, sadness, embarrassment, anger, guilt, and disgust), Extraversion (i.e., tendency to like people, prefer being in large groups, and desire

<sup>1</sup> This distinct area avoids the “conceptual debate” between social psychologists and personality researchers. The former ones consider cognitive psychology and not personality, as their “secondary” classification, whereas personality researchers view clinical or developmental psychology and not social psychology, as their “secondary” classification (Tracy, Robins & Sherman, 2009).

<sup>2</sup> In understanding innovative behaviour, it is essential to make also the distinction between creativity and innovation - whereas *creativity* refers to the production of novel, appropriate ideas by individuals or small groups, *innovation* is the successful implementation of creative ideas (Amabile & Fisher, 2000: 481).

excitement and stimulation; likely to be assertive, active, talkative), Openness (i.e., tendency to have an active imagination, aesthetic sensitivity, intellectual curiosity, and be attentive to feelings), Agreeableness (i.e., tendency to be altruistic, cooperative, and trusting), and Conscientiousness (i.e., tendency to be purposeful, organized, reliable, determined, and ambitious)” (Major, Turner, & Fletcher, 2006:928). Out of these five personality traits, only *openness*, *conscientiousness* and *neuroticism* were found to influence innovative behaviour. Whereas *openness* and *neuroticism* impacts positively innovative behaviour, *conscientiousness* (or need for achievement - Major, Turner, & Fletcher, 2006) have been found to have both a positive and a negative effect on our dependent variable. Individuals who score high on conscientiousness are ambitious, hardworking, competitive and keen to improve their social standing and place high value on achievement (Papadakis & Bourantas, 1998). For individuals that score low on conscientiousness, the opposite argumentation holds (Moon, Kamdar, Mayer, & Takeuchi, 2008), conscientiousness impacting innovative behaviour in a negative way.

Findings show that the relationship between *openness* and *conscientiousness* and innovative behaviour is moderated by a number of variables (e.g., Zhou & George, 2001). In this sense, feedback valence (i.e., the extent to which the feedback is positive or negative) (Zhou & George, 2001), in a work setting, influence the extent to which individuals exert (more or less) innovative behaviour. The relationships are strengthened when both unclear ends and unclear means are high (Zhou & George, 2001). Unclear ends refer to when individuals are “unable to anticipate what the end results of their efforts at work will be” whereas unclear means refer to when it is “difficult to determine how to reach work goals or objectives” (Zhou & George, 2001:514). The relationships are also strengthened when the behaviour of individuals is closely monitored by their supervisors. This is an interesting finding as this moderator strengthened the relationship under review but only when individuals receive inaccurate communication from their co-workers, when they did not receive constructive help from their co-workers and only when they work in a negative work environment (Zhou & George, 2001). Personality traits seem to be important predictors of the innovative behaviour as they have an influence over innovative strategies and outcomes (Hambrick & Mason, 1984), determining the innovation effectiveness and efficiency within organisations.

A second identified personality characteristic refers to *pro-activeness*. *Pro-activeness* (Seibert, Kraimer, & Crant, 2001) is approached not so much as a quality that can be learned but rather as a distinct and stable disposition. Considering dispositional traits as “stable tendencies in patterns of response across a wide variety of situations (Diener & Larsen, 1984:880) *pro-activeness* is defined as “a dispositional construct that identifies differences among people in the extent to which they take action to influence their environments” (Bateman & Crant, 1993:103). The concept is grounded in the interactionist approach, which incorporates a central characteristic: individuals can directly and intentionally influence their social and non-social environments (Bateman & Crant, 1993; Crant & Bateman, 2000). It has been found that individuals high on *pro-activeness* are constantly focused on finding improved ways to do things (Seibert, Kraimer, & Crant, 2001), to pursue a course of action, to effect meaningful change. This is essential to innovative behaviour as when hiring for positions that require continuous learning and an innovative attitude, organisations may wish to target those individuals whose personality traits are predictive of innovative behaviour (Major, Turner, & Fletcher, 2006).

Focusing now on the third personality characteristic identified in the reviewed literature, the sense of *duty* or *reliability* refers to offering suggestions for challenging the status quo and increasing the welfare of the organization (Moon, Kamdar, Mayer, & Takeuchi, 2008). Our findings point to a positive influence of the sense of duty on innovative behaviour, dutiful individuals demonstrating feelings of responsibility and a genuine concern toward the organization. It is apparent from this finding that by observing some of the personality traits organisations seek in potential employees, the sense of duty is one facet of personality that enhances innovative behaviour. Additionally, individuals possessing this trait possess the most potential to promote change which is both necessary for high productivity and objective performance (Moon, Kamdar, Mayer, & Takeuchi, 2008).

*Propensity to innovate*<sup>1</sup> which refers to the tendency of individuals to seek out new and improved ways of working (Bunce & West, 1995) is a fourth personality characteristic that was found to have a

<sup>1</sup> Bunce and West (1995) also mention about “rule independence” which is a 5-item scale drawn from the 12 items that produced the propensity to innovate measure. The main difference is that these items focuses on the extent to which individuals attempt to break away from existing norms and procedures relating to the way in which the job is done.

positive impact on innovative behaviour among health-service workers. Specifically, this personality characteristic determines health-care professionals to find innovative ways to respond to high pressure of work, staff shortages and interpersonal difficulties with patients (Bunce & West, 1995). Interestingly, this finding points to the efforts to increase individual innovation at work by, perhaps, focusing on altering individual's propensity to innovate and rule independence. Altering refers to the environmental contingencies such that individuals who are required to innovate develop a view of themselves as being likely to introduce new and improved ways of doing things at work. In sum, propensity to innovate was a more reliable, valid measure and a powerful predictor than the alternative, rule independence, of innovative behaviour (Bunce & West, 1995).

### 3.2.2 Motivation

A second category of studies uncovered by the reviewing process showed that *motivation* related characteristics impact positively innovative behaviour. Cognitive evaluation theory (CET) which is a sub-theory of self-determination theory (SDT) (Deci & Ryan, 1985) distinguishes between intrinsic and extrinsic motivation which are based on different reasons that give rise to an action. Whereas intrinsic motivation refers to doing something because it is inherently interesting or enjoyable, extrinsic motivation refers to doing something because it leads to a separable outcome (Deci & Ryan, 2000). Psychological construct that describe the motivational orientations individuals have when doing an activity (Amabile, 1997) intrinsic motivation has as underlying needs, the need for autonomy and competence (Deci & Ryan, 1985). Extrinsic motivation, in turn, through the processes of internalization (i.e., taking in a value) and integration (i.e., transforming the value into one's own to radiate from one's self) makes behaviours become more self-determined (Deci & Ryan, 1985). Having said that, Rui Sun and Guoquan Chen (2008) show that *intrinsic motivation* is recognized as a core characteristic for employee creativity. On the other hand, Sun & Wang (2009) explicitly note that *extrinsic motivation* refers to the motivation which employees are attracted to be innovative by the external outcomes that doing the task might yield. These findings show that internal and external "incentives" influence motivation but interestingly would be to understand to what extent incentive practices motivate explorative and/or exploitative innovation outcomes. Additionally, managers should give a proper attention to psychological processes underlying motivation so that they can designate the orientation of innovation, aspect that was not found so far in the reviewed literature.

### 3.2.3 Cognitive

Thirdly and referring to the *cognitive* category illustrated in Figure 1, there are studies (Scott & Bruce, 1994; Taggar, 2002; Carmeli, Meitar & Weisberg, 2006; Jing, 2006; Xiaojun & Peng, 2010) that brought to light the importance of the cognition on enhancing innovative behaviour. In this respect, cognitive ability, best conceptualised as a unitary construct, refers to the fact that individuals high on cognitive ability, generally perform better, they are better at information processing and they are more innovative (Taggar, 2002). While cognitive ability is measured by aptitude tests such as intelligence tests (Taggar (2002) (Wonderlic Personnel Test – a vocational and intelligence test used to measure an individual's domain-relevant skills, a component of creativity), cognitive style refers to the way individuals think, perceive and remember information. From a cognitive psychology perspective it can be said further, that *problem-solving* represents a cognitive style (Messick, 1976), alongside perceiving, thinking, etc. *Intuitive problem-solving style*, the second identified cognitive characteristic, is a mental process that points to an independent mode of thinking characterized by overlapping separate domains of thought simultaneously, a lack of attention to existing rules and disciplinary boundaries, and an emphasis on imagery and intuition (Scott & Bruce, 1994). The distinction between cognitive ability and cognitive style (Allinson & Hayes, 1996) is essential in research as it might trigger different strategies to display innovative behaviour.

Continuing with the third characteristic, *creative* individuals produce novel ideas that are useful and appropriate to a given situation (Amabile, 1983) and by doing that, they innovate, implement their ideas in research and development (Miron, Erez & Naveh, 2004). Creativity in these studies differs from innovation as the former refers to idea generation alone. These findings are interesting as relatively recently authors (e.g., Anderson, De Dreu & Nijstad, 2004) stressed the importance of manipulating creativity within experimental settings to measure its impact on innovative performance. Additionally, although creativity may be dysfunctional to performance outcomes that require conformity and attention to detail (Miron, Erez, & Naveh, 2004) it is, as these studies show, a construct with an essential impact on the innovative behaviour within the workplace.

The article of Jing (2006) is the only one that shows a mediated relationship between *knowledge conversion capability*, the next in line cognitive characteristic, and innovative behaviour. According to

organisational knowledge creation theory (Nonaka & von Krogh, 2009) knowledge conversion explains the interaction between tacit and explicit knowledge but organisational learning theory encompasses the perspective of individual who is capable of incorporating implicit and explicit elements of learning and knowledge (Jing, 2006). Individual network centrality variable (Jing, 2006) explained the relationship between knowledge conversion capability and innovative behaviour and this is not surprising since knowledge conversion explains the interaction between tacit and explicit knowledge which can be best clarified when referring to the individual position within a network (Jing, 2006). The pattern of this findings support the knowledge spiral theory of Nonaka and von Krogh (2009) which says that socialization, externalisation, combination and internationalisation exist in a dynamic interaction shedding a new light on the application of the role of knowledge in determining innovative behaviour, creative output.

Seen as essential prerequisites for innovation (Lu Xiaojun & Li Peng, 2010), *continuous learning, inquiry and dialogue* are *self-leadership skills*, the last to discuss characteristics from this third category, were discovered to be important to enhancing innovative behaviour. In this sense, individual innovative behaviour is not only influenced by organisational environment but also (re)shaped by various personality traits. The study of (Lu Xiaojun & Li Peng, 2010) is illustrative in this respect as the impact of individual learning on innovation lies on the ability of employees to stimulate new ideas. An integrated approach is of great importance in assessing the impact on innovative behaviour by taking into consideration the interaction of organisational environment factors and personality traits (e.g., self-leadership skills) on individual innovative behaviour rather than consider their influence separately.

#### 3.2.4 Affective

Fourthly and by looking at the *affective* category, it can be said that, according to affective events theory (AET), affective events are things that happen in the workplace that cause individuals to experience positive or negative affect (Weiss & Cropanzano, 1996). Maslach, Schaufeli and Leiter (2001:417) conceptualized *employee engagement*, the first affective characteristic surfaced by the reviewing process, as the positive antithesis to burnout, defining it as “a persistent positive affective state ... characterized by high levels of activation and pleasure”. The next characteristic, *commitment*, was defined as “the relative strength of an individual’s identification and involvement with the organization” (Mowday, Porter & Steers, 1982:27) which refers specifically to a mind state of an individual while working. Findings showed that both *employee engagement* and *employee commitment* have a direct positive relationship with innovative behaviour. According to the model of commitment of Meyer and Allen (1991) commitment has three different components that correspond with different psychological states: affective, continuance and normative commitment. Based on recent research it can be noted that only the first type of commitment was mostly tackled (Aryee, Walumbwa, Zhou, & Hartnell, 2012) which refers to the individual’s positive emotional attachment to the work s/he does (e.g., “At work, I feel full of energy”). The article by Aryee, Walumbwa, Zhou, and Hartnell (2012) contributes to the literature by applying aspects of self-concept-based theory (e.g., how employees come to feel about themselves) to probe the psychological mechanisms by which this contribution occurs. Additionally, employee work engagement may be a proximal psychological resource through which transformational leadership enhances innovative behaviour.

In reviewing the literature, *humour* is the last to mention characteristic from the affective category. Surprisingly, *aggressive humour*, a variable that is considered to carry optimism, belief and courage was found to be negatively related to innovative behaviour (Ho, Wang, Huang, & Chen, 2011). In contrast, *self-enhancing humour* proves itself essential for the innovative behaviour of the leaders. Having this personal trait can help them cope with a highly competitive environment. Additionally, being composed by both bad and good traits and seen, within the workplace, as a competency of leaders, humour may help organisations establish a more proactive and innovative strategy, leaders being capable to envision their future success (Ho, Wang, Huang, & Chen, 2011).

#### 3.2.5 Demographics

Finally, *age, tenure* and *education* are demographic variables that are often included in research as control variables. They offer a good index of overall experience and firm-specific skills and, consistent with previous research, they are classified under *demographics*. Based on the predictions of the upper echelons theory, innovative outcomes are partially predicted by managerial background characteristics (Hmbbrick & Mason, 1984). Age, for instance, was found to have a positive significant relationship with role innovation (i.e., the extent to which the respondents did their job differently from the people who did the job before them) (West, 1987). This direct positive relationship was not found in the case of *tenure*, or showed mixed effects in relation with innovative behaviour (e.g., Papadakis & Bourantas,

1998). This finding is consistent with previous research which states that long tenured individuals are not willing to innovate, dismissing their psychological commitment towards this type of behaviour.

Overall, findings from Figure 1 illustrate mixed results as well as either positive or negative results. Within the same Figure 1, the two additional boxes named ‘Moderators’ and ‘Mediators’ list a number of variables that influence and explain the relationship under investigation; no variables influence or explain the relationship between affective characteristics, motivation and demographics and innovative behaviour.

#### 4 Impact of Individual Characteristics on Team Innovation

Based on the same structure presented in section 3, this section starts with defining the relevant concepts that are illustrative for the relationship between individual characteristics and team innovation. Secondly, as shown in Figure 2 and as resulted from the reviewed literature, findings explain the (nature of the) relationship between individual characteristics and team innovation. Additionally, as previously mentioned, we also refer to the role of the moderators and the mediators variables for the relationship under investigation.

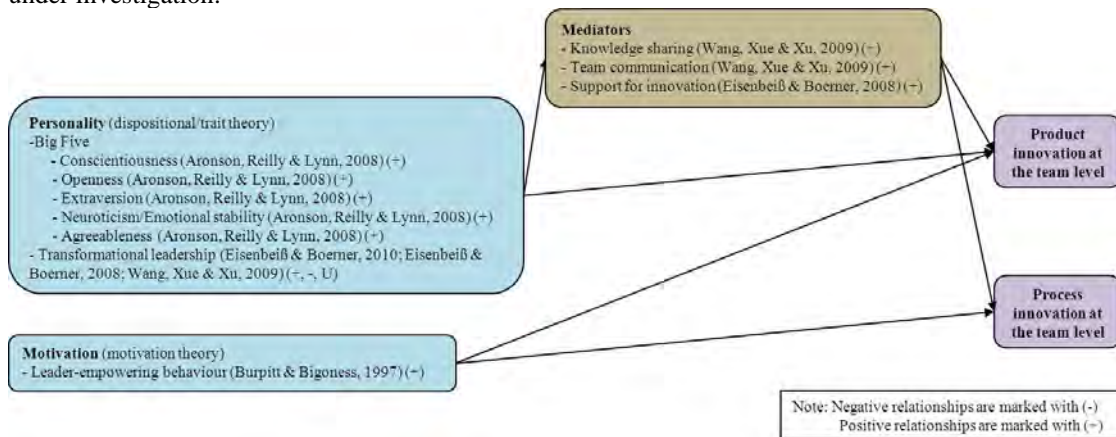


Figure 2 Individual Characteristics and Their Influence on Various Types of Innovation at the Team Level

##### 4.1 Definition and categorization

The classification procedure of individual characteristics follows the previous structure and based on the reviewed literature, only two main categories were identified this time: *personality and motivation*. In the case of innovation, various types<sup>1</sup> were identified at the team level of analysis. We created three categories in order to classify them: *technological innovation*<sup>2</sup>, *product innovation* and *process innovation*. The underlying explanation for creating these three categories was that previous research, when researching about how individual characteristics impact innovation, only looked at innovation from one-dimensional perspective despite the fact that innovation literature presents innovation as a multi-dimensional construct (Gopalakrishnan & Damanpour, 1997).

The first type of innovation, the *technological innovation*, provides organisations with two options: either exploiting current technologies or generating new possibilities through exploration (Benner & Tushman, 2002). Organisations want to protect their products and processes against prospective competitors and they often apply for patents for their innovations (Archibugi & Pianta, 1996). Patents are indicators of investments made in technology, and technological innovation will refer therefore to patents, as a direct outcome of the innovative process (Archibugi & Pianta, 1996).

The second type of innovation, *product innovation*, is seen as those changes in the things (e.g., products/services - a new design of car) an organization offers (Tidd & Bessant, 2009). In other words, product innovation refers to outputs and services that are introduced for the benefit of customers or clients (Gopalakrishnan & Damanpour, 1997). Previous literature showed that product innovation is closely related to the concept of technological innovation. The distinction between the two (which defines the conceptual boundaries for this literature review as well) lies in the fact that technological

<sup>1</sup> Organizational innovation was measured, in several studies, as product and/or process innovation and those studies were included and coded either for product or process innovation, respectively.

<sup>2</sup> This type of innovation is only present for firm-level innovation, within section five of this paper, but it is already mentioned here to keep a consistency in the approach.



innovation refers more to the product characteristics or intended uses whereas product innovation utilizes new or existing technologies to create commercial success. The more complex the product and/or the more radical the innovation, the greater its perceived commercial success (Gatignon, Tushman, Smith & Anderson, 2002).

The third type of innovation is *process innovation* which involves a set of ideas that are incorporated in the product itself; process innovation makes reference to those changes in the ways products are created and delivered (Tidd & Bessant, 2009). An example would be the change in the manufacturing methods and equipment (e.g., rear suspensions, gas tanks, roof, body side panels etc.) used to produce a car (Tidd & Bessant, 2009). Previous research approached a complementarity perspective when speaking about product and process innovation (Garcia & Calantone, 2002). However, throughout this paper a process innovation only assists to produce products or services (outputs) from inputs.

Based on the reviewed literature, for the relationship between individual characteristics and team innovation, only product and process innovation categories surfaced and, in the light of these two types of innovation, findings are presented in the next section.

## 4.2 Findings

### 4.2.1 Personality

To start with, studies (Aronson, Reilly, & Lynn, 2008; Duanxu Wang, Huijuan Xue, & Jie Xu, 2009; Eisenbeiss, van Knippenberg, & Boerner, 2008; Eisenbeiss & Boerner, 2010) showed that *personality* characteristics such as openness, emotional stability, consciousness, extraversion etc. of the leaders were found to matter for both product innovation and process innovation. In order for the leaders to respond to the uncertain demands of the innovation, at the team level, they need to be equipped with well-defined personalities to be able to cope with and lead effectively the entire process of innovation. One of the most controversial of the Big Five traits, openness was not related to many applied criteria before and, based on the study by Aronson, Reilly and Lynn (2008), leader's openness was found, this time, to be significantly related to new product development (NPD) success, especially when the innovation is radical (Aronson, Reilly, & Lynn, 2008).

The reviewed literature also highlighted the role that *leadership* plays for the R&D team innovation. Integrating two contradictory positions, Eisenbeiss and Boerner (2010) found a U-shaped relationship between transformational leadership and R&D team innovation. They showed that R&D team innovation was high both under high and low levels of transformational leadership. In contrast, R&D team innovation was low under moderate levels of transformational leadership. These findings matter for understanding the relationship between individual characteristics and product innovation. Moreover, when leaders hold moderate levels of transformational leadership they might need professional training to be able to enhance team innovation success (Eisenbeiss & Boerner, 2010). Other authors (Duanxu Wang, Huijuan Xue, & Jie Xu, 2009) found a negative relationship between transformational leadership and product innovation, a relationship also mediated by knowledge sharing and team communication. In contrast, Eisenbeiss and Boerner (2008) found that transformational leadership was positively related to product innovation at the team level. As their results showed, transformational leadership may be instrumental in team innovation but is not sufficient to stimulate team innovation. The relationship was mediated by the support for innovation variable which referred to the cooperation among team members and their mutual assistance in the development and application of novel ideas (Eisenbeiss & Boerner, 2008). These findings point to the need of an integrative perspective by addressing calls for research identifying relevant mediating variables and moderators that influence the relationship between various individual characteristics and team innovation. This might also contribute to the advancement of the team innovation literature.

### 4.2.2 Motivation

*Motivation* represents the second characteristic that was found to have a direct impact on both product and process innovation. In line with the essence of the motivation theory, *leader-empowering behaviour* refers to a relational and a motivational dimension. This means that leaders can empower employees to believe and increase their self-efficacy and sense of power (Burpitt & Bigoness, 1997) in order to enhance team-level innovation in professional project teams. This individual characteristic determined team-level innovation which was more complex than initially conceived. Team-level innovation had a market-orientation (i.e., acquisition of new skills to improve the team's ability) and a problem-solving orientation (i.e., new application of familiar technique to develop new solutions). These findings prove themselves important as they demonstrated that managers can employ specific behaviours to stimulate innovation among project teams (Burpitt & Bigoness, 1997).

Overall, the findings from Figure 2 showed mixed effects and they direct attention towards the fact that there is scarce or no information on possible cognitive, affective and demographic characteristics that might impact team level product and process innovation. Moreover, based on the reviewed literature, it can be seen that technological innovation was not predicted by any individual characteristics. Additionally, the need for research on possible mediating and moderating variables is deemed to be necessary to understand *how* individual characteristics impact various types of innovation, at the team level of analysis.

### 5 Impact of Individual Characteristics on Firm Innovation

Following the same structure as in previous sections, this section makes an in-depth assessment of the reviewed literature on the relationship between individual characteristics and firm-level innovation. As illustrated in Figure 3, the role of moderators and mediators is again highlighted.

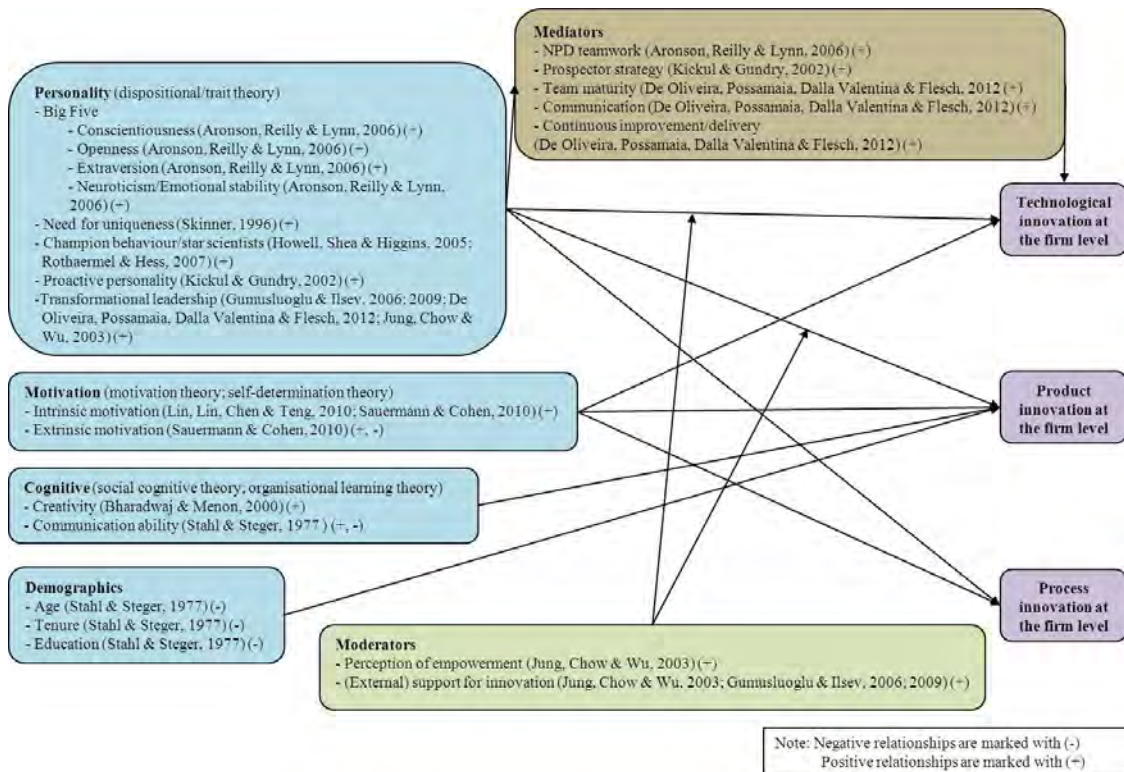


Figure 3 Individual Characteristics and Their Influence on Various Types of Innovation at the Firm Level

#### 5.1 Definition and categorization

The same framework for classifying individual characteristics and the previously mentioned categorization of innovation (i.e., technological, product and process innovation) are used. Almost similar with the individual characteristics impacting individual innovation (section 3), individual characteristics impacting firm innovation seem to cover four main categories discovered in the existent and reviewed literature: *personality*, *motivation*, *cognitive* and *demographics*. As far as the innovation at the firm level is concerned, the existent literature revolves especially around product innovation. In the next section findings are presented.

#### 5.2 Findings

##### 5.2.1 Personality

To begin with, a consistent number of studies (Aronson, Reilly, & Lynn, 2006; de Oliveira, Possamai, Dalla Valentina, & Flesch, 2012; L. T. Gumusluoglu & Ilsev, 2007; L. Gumusluoglu & Ilsev, 2009a; L. Gumusluoglu & Ilsev, 2009b; Howell, Shea, & Higgins, 2005; Jung, Chow, & Wu, 2003; Kickul & Gundry, 2002; Rothaermel & Hess, 2007; Skinner, 1996) focused on *personality* related characteristics. All these studies found that personality positively influences all three types of innovation (i.e., technological, product and process innovation) this time identified at the firm level. For instance, from



the *Big Five* traits only consciousness, openness, extraversion and neuroticism/emotional stability were used by Aronson, Reilly and Lynn (2006) to examine the effect of leader personality on new product development (NPD) project performance, under differing conditions of uncertainty. Essentially, it has been found that under uncertain settings, the process of the new product development is iterative and experiential and NPD leaders, high on openness, should be more successful on such error and trial tasks (Aronson, Reilly, & Lynn, 2006). Conversely, under more certain conditions, characteristic of incremental innovation, extensive planning is appropriate, making the conscientiousness of the leader to be a desirable trait. The model advanced by Aronson, Reilly and Lynn (2006), for instance, posits *teamwork* as a mediating variable between leader personality and NPD performance. Their conclusion was that leader openness had a significant influence on NPD project performance as well as a significant indirect influence through teamwork under high uncertainty but not under low uncertainty conditions.

It is interesting to note that other studies (Howell, Shea, & Higgins, 2005; Rothaermel & Hess, 2007) highlighted that *champions*, individuals who informally emerge to actively and enthusiastically promote innovations through the crucial organisational stages (Howell, Shea, & Higgins, 2005: 642), are necessary to overcome the social and political pressures imposed by an organization and convert them to its advantage. Nowadays, the idea that *everyone* can enhance innovation is a fact and this perspective is a departure from how things used to be in the past; requires champions to lead others to free their valuable perspectives that might lead innovation in many dimensions.

*Pro-activeness* (Kickul & Gundry, 2002), this personality stable disposition previously found to impact individual innovation (section 3.2), was found to influence, this time, product innovation at the firm level. This finding is in line with the essence of the theory of entrepreneurial alertness which describes entrepreneurs' ability to "see", to discover and exploit opportunities that others miss. From this perspective pro-active personality (Bateman & Crant, 1993) is linked to a strategic orientation which in turn determines the development of new and improved products. With regard to the mediators, the model proposed by Kickul and Gundry (2002) incorporates *prospecter strategy* as a mediating variable between proactive personality of the entrepreneurs and product innovation at the firm level. This explains the critical link between the business owners' proactive personalities and the ways they engage in innovative processes to develop innovative firm level systems.

Also from the personality viewpoint, the last identified individual characteristic is *transformational leadership* which was found to influence product innovation. According to the transformational leadership theory leaders are considered to have specific skills and abilities that determine the others to achieve innovative and creative results. This type of characteristic brings a significant contribution to the literature because only a handful of empirical studies (de Oliveira, Possamai, Dalla Valentina, & Flesch, 2012; L. T. Gumusluoglu & Ilsev, 2007; L. Gumusluoglu & Ilsev, 2009a; L. Gumusluoglu & Ilsev, 2009b; Howell, Shea, & Higgins, 2005; Jung, Chow, & Wu, 2003) have looked at the effect of transformational leadership on innovation at the firm level. *Communication* and *continuous improvement* and *delivery* represent other mediating variables that link transformational leadership and product innovation at the firm level of analysis. These variables have a significant role as the results showed large managerial implications, because they help in understanding an increase in performance levels in innovation projects (de Oliveira, Possamai, Dalla Valentina, & Flesch, 2012). With regard to the moderators, it can be mentioned that under the conditions of *empowering employees* they are more likely to promote creative endeavours and transformational leadership positively impacts product innovation (Jung, Chow, & Wu, 2003). The same effect was found when there was *support for innovation*. Because the behaviour of organisational members occur in a far more complex situations, examining this issue at a cross-level of analysis might yield interesting results as other additional variables might also be present.

### 5.2.2 Motivation

Focusing on the second category, *motivation*, both *extrinsic* and *intrinsic motivations* were found to have an effect on all three types of innovation: technological, product and process innovation. A number of studies (Liang-Hung Lin, Wei-Hsin Lin, Ching-Yueh Chen, & Ya-Feng Teng, 2010; Sauermann & Cohen, 2010) focused on the role of money, intellectual challenge and independence as having a positive impact on firm level innovation. However, studies also highlighted negative effects of motivation on innovation reflecting perhaps that respondents with a strong desire for responsibility are less interested in working at the bench and prefer broader organisational responsibilities, dampening their own inventive productivity (Sauermann & Cohen, 2010). Examining empirically to what extent pecuniary and non-pecuniary motives are related to innovative performance, a noted finding was that the desire for responsibility was negatively associated with patent applications (Sauermann & Cohen, 2010). These findings are in line with the essence of the motivation crowding theory (Frey & Jegen, 2001) and

self-determination theory (Deci & Ryan, 1985) which state that extrinsic and intrinsic motivation describe psychological needs and processes that once fulfilled, they can determine desirable outcomes and be significant drivers of innovation.

### 5.2.3 Cognitive

In addition to the personality and motivation characteristics, *cognitive* related characteristics were also covered by the existent and reviewed literature. These individual characteristics only related to product innovation and not to technological or process innovation. Studies (Bharadwaj & Menon, 2000; Stahl & Steger, 1977) showed that *creativity*, a property of the thought process that can be acquired and improved through instruction and practice (Bharadwaj & Menon, 2000), led to significantly superior innovation performance in the case of product innovation. Within the new product development literature, the role of creativity in making innovation happen in organisations was unexplored and the empirical study by Bharadwaj and Menon (2000) for instance, provided evidence that individual creativity mechanisms lead to innovation. Creativity is thus seen not necessarily just as an innate phenomenon, but can also be inculcated, encouraged and trained (Bharadwaj & Menon, 2000) to enhance innovation at the firm-level. *Communication ability*, seen as being developed with other professionals within one's own group or with professionals outside one's own group, within laboratory, on technical matters, was found to have positive influence on product innovation (Stahl & Steger, 1977). However, the same respondents - civilian and military scientists/engineers in 105 work groups in three Air Force laboratories – developing communications with the group leaders on technical matters determined a negative impact on product innovation. These findings appear to lend credence to the idea that stimulation due to contact with peers is critical in R&D work.

### 5.2.4 Demographics

Finally, the last category of individual characteristics impacting the firm-level innovation is clustered under *demographics*. For this particular category the study by Stahl and Steger (1977) showed a negative relationship between *age*, *tenure* and *education* and product innovation. These results are not surprising as findings in psychology which address, for instance, the aging issue state that aging causes certain abilities such as learning and memory to decrease. Furthermore, Ahuja, Lampert and Tandon (2008: 62) listed as an argument that older managers are less able to invest in innovation being less willing to take risks. Additionally, tenure was found to have a negative effect on innovation and these findings come in contradiction with those arguments that sustain that tenured managers impact positively innovation efforts. The underlying explanation is that they are more capable of “getting things done” and are able to use the pool of resources in a more valuable manner. Important to note is that there is no literature addressing whether and how demographics are related to technological or process innovation.

Overall, studies from Figure 3 provided mixed results showing that personality, motivation and cognitive related characteristics impact all three types of innovation at the firm level. However, the number of moderators and mediators is considered to be small, these types of variables being only identified for the relationship between personality traits and product innovation.

## 6 Conclusion and Discussion

In this section the most important findings of the current literature review are discussed. As already anticipated in the beginning and throughout the paper, the main focus in this part is on highlighting important gaps in the literature on innovation. By connecting and assessing the insights and evidence brought in by the reviewing process, we take a critical stance towards the existent literature and support a comprehensive overview of the impact of individual characteristics on (1) innovative behaviour, (2) innovation at the team level and (3) innovation at the firm level of analysis. Additionally, this section is constructed around three main criteria that help us build up the main discussion points: (1) the *amount* of the studies – it helps us to assess to what extent there has been a lot or not (that) much research done in the field; (2) the *content* of the studies – it helps us identify the specificity of the research and whether there has been a scant attention given to particular aspects compared with other aspects on innovation; (3) the *similarity* and the *difference* between the studies – it helps us assess to what extent there is either consistency or, on the contrary, dispersed interest in research on innovation.

By looking at the *amount* of the studies, firstly, it can be noted that studies addressing the impact of individual characteristics and innovation at the team level of analysis are limited, in number, compared with the other two streams of literature (i.e., at the individual and firm level of analysis). Secondly, innovative behaviour is predicted by five categories (i.e., personality, motivation, cognitive, affective and demographics) of individual characteristics while team innovation is predicted by only two (i.e.,

personality and motivation) and firm innovation by four categories (i.e., personality, motivation, cognitive and demographics). Thirdly, both moderators and mediators were found to influence only the relationships between the individual characteristics and (1) innovative behaviour and (2) firm innovation. For the relationship between individual characteristics and team innovation, only a list of few mediator-variables was found, and no moderator-variables. Finally, individual characteristics predict only product and process innovation at the team level while at the firm level, individual characteristics impact a third type of innovation, technological innovation.

In terms of *content*, firstly, it can be noted that **personality**-related characteristics such as the Big Five traits were found to have mixed results on innovative behaviour and only positive effects on product innovation at the team and firm level of analysis. More research should address this path of research by, for instance, integrating these three streams of literature and comparing and testing these specific characteristics in one single study. Secondly, as far as the **motivation** category is concerned, studies revealed, as an exception, mixed results for the relationship between individual characteristics and innovation at the firm level of analysis. However, within all three streams of literature, the overall findings support consistent positive results and a direct relationship for the relationship under investigation. Thirdly, importantly to note is that **cognitive** related characteristics such as cognitive ability, knowledge conversion capability, communication ability and intuitive problem-solving style were not found to impact product innovation or process innovation at the team level. Additionally, cognitive related characteristics impact positively innovative behaviour while their impact on product innovation at the firm level provides mixed effects. In line with these ideas, the team level of analysis should be explored more by research and empirically assess the impact of cognitive individual characteristics on innovation. Fourthly, a unique finding is represented by the **affective**-related characteristics (e.g., work engagement, self-enhancing humour) that were found to have an impact on innovative behaviour. Especially for this category, research should address different types of innovation at the team and also at the firm level of analysis; it might also advance the field by taking into considerations emotions and affective behaviour to generate innovative output. Additionally, age, tenure and education – **demographics** – known for being used as control variables, within studies, offer divergent results. The added value of the age, tenure and education in determining innovative outcomes might prove useful especially if researched to impact innovation at the team level of analysis. One can easily observe that these characteristics lack in Figure 2. Finally, it is essential for research to focus, when it comes about the moderators and mediators variables, on the role of managers that should “create a mind-set for innovation, make innovation meaningful for the entire firm and make innovation part of strategic conversation” (Ahuja, Lampert, & Tandon, 2008: 57). Feedback valence, support for innovation, perception of empowerment can be conditions used by researchers to test the impact of individual characteristics on innovation at the team/project level of analysis and not only at the individual and firm level. Furthermore, this argument is in line with the work of Cummings and Oldham (1997) who found that organizations which provided a supportive environment and context for creativity tend to reap greater benefits from individual employees.

Assessing the *similarities* and *differences* between studies, one can observe that there is a similarity with regard to the level of analysis when it comes about the personality- and motivation-related characteristics. Both are important for innovative behaviour and also for the innovation at the team and firm level. As far as the cognitive- and demographic-related characteristics are concerned, these are important for innovation at the individual and firm level of analysis while affective-related characteristics only at the individual level of analysis. *Proactive personality and creativity*, for instance, have a positive impact on innovative behaviour and on the product innovation at the firm level. In terms of differences, what comes out as striking from the reviewing process is the scant research attention that this topic received at the team level, compared with the research conducted at the individual and firm level. There is no surprise that more research has been conducted at the individual level compared with the other two levels as the focus of this topic is on the impact of *individual* characteristics on innovation. A further expectation would be that the ‘next in line’ level of analysis (i.e., the team level) would pay also a considerable amount of attention on this topic. However, it seems that more research has been conducted at the firm level of analysis than at the team level of analysis. Thus, it is timely to close this gap and advance research in the direction of complementing this middle level of analysis, which links the other two levels located at different ends of the spectrum of analysis.

Although all the three streams of literature took into account the role of moderators and mediators, their use is limited and, essential to note is especially their scarce presence at the team level of analysis.

Future research can bring a significant contribution by shedding light on the variables that influence and explain the relationship between individual characteristics and innovation at different levels of analysis. Another important avenue for future research is addressing not only various types of innovation but also degrees of innovation (i.e., radical and incremental) (Archibugi & Pianta, 1996; Benner, 2002; Gopalakrishnan & Damanpour, 1997). In this sense, research can identify which specific individual characteristics impact radical or incremental innovation and with what effects. Additionally, because previous research did not distinguish between more radical and incremental ways of innovation, future research could also address these issues especially at the project level of analysis where nowadays there are more iterative ways of coming up with new products and services.

In a conclusive manner, the aim of this systematic literature review was to provide insights through a theoretical synthesis into the fields of innovation, new product development and psychology. Serving both academic and practitioner communities, this reviewing process is also meant to increase methodological rigour (Tranfield et al., 2003) and develop a reliable knowledge base for a future pragmatic research on innovation.

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# Innovation of Credit System of Loan Students at Chinese Universities

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**Abstract:** There are many factors to influence the loan students to pay for the debts. These factors will influence the will of students to pay for the loans and the risk of government-subsidized student loan. This article has analyzed government-subsidized student loan under imperfect and perfect credit system, and has put forward that to analyze the behavior of paying for the loans is important which can help we explain the risk of the loans. Through this analysis, the innovation of credit system becomes the important factor to the students who choose to pay for the loans or not, and to innovation the credit system, students, colleges and the banks all can benefit.

**Key words:** The innovation; Credit system; Game theory; Government-subsidized student loan; Management risk

## 1 Introduction

At present, There are many factors to influence the loan students to pay for the debts. These factors influence the will of students to pay for the loans and the development of government-subsidized student loan. To improve government-subsidized student loan, to help the poor students finish their studies, to drop the harmful risk of banks must overcome the unfavorable factors which influence government-subsidized student loan. We should improve the credit system and strengthen the system innovation to resolve these questions. Now more and more scholars come to realize that the innovation mechanism and credit system can make the government-subsidized student loan more scientific and reasonable. However, larger viewpoints often arises from different kinds of credit system how to innovate. These viewpoints<sup>[1][2]</sup> have stressed to design government financial aid programs. They think it is necessary to consider the loan default, family income and student demographic characteristics.

For many years, worldwide scholars have developed a lot of models. At present, the traditional methods mainly include the maximum-likelihood technique probit, an alternative to traditional price response theory etc. Knapp and Seaks (1992), drawing methodological guidance from earlier work by Greene (1989), studied nearly 2000 traditional 2- and 4-year college students who had attended one of 26 Pennsylvania institutions, had borrowed federally guaranteed Stafford loans, and had graduated (or dropped below half-time enrollment)during the academic year 1984–1985. The authors found each borrower characteristics to have a statistically significant association with a lower probability of default. St.John also thinks we should treats student responses to different forms of aid as uniform (1995).

In China, the students loan has carried out in 2004. Because of short history, how to control the loan risk, how to improve the loan system, and how to improve the credit system become impetuously in China.(Wang Hengli, 2005; Ding Hua, 2005)<sup>[3]</sup>

## 2 Analysis of Imperfect Credit System for Students Loans

### 2.1 Relationship between the banks and the loan students

When the credit system is imperfect, the management risk of the banks will increase without the perfect information which the loan students can pay for the debt or not. So in order to realize the maximum profit, the banks must adopt measures to reduce the unfavorable risk. According to the tradition ideas, the banks may carry out the choice behavior to provide the loans to students in terms of the probability distribution of the default students. But the banks have difficulty to carry out this activity. Because government-subsidized student loan just has carried out only 8 years, it is difficulty to obtain the probability distribution of the default students. So in order to reduce the risk, the banks must look for another risk undertaker\_that is the college. The relationship between the banks and the loan students becomes the relationship between the banks and colleges and the relationship between the colleges and the students who got the government-subsidized loan.

### 2.2 Relationship between the banks and the colleges

In terms of the theory of agreement agency, in order to reduce the the moral risk, the clients should design reasonable contract. The contract of the banks design builds on the colleges duty which is to press the students to pay for the debts on time. If the colleges do not finish this duty, the banks will

reduce or cancel the education loan. For the colleges, if they increase the press on the students, the cost will add, and if they do not carry out this duty, the colleges development will frustrate. So the banks make the colleges get into the morass.

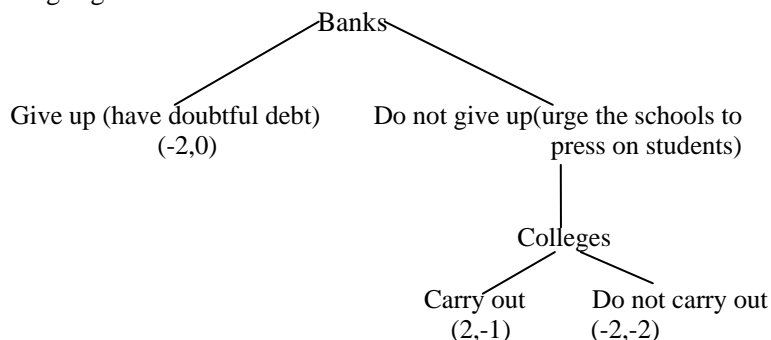


Figure 1 The Banks and Colleges Game Playing

The brackets is the profit of banks and colleges. Under this contract, the colleges is the acceptance of the biggest risk. No matter the colleges carry out the duty or not, they ain't the biggest beneficiaries. Furthermore regardless of income, the colleges still run into morass. On the one hand, the colleges superior will exert pressure to the colleges to increase the loans. This is a good things that can assure the poor students to finish their studies. But the education directors interpose the colleges overmuch, the development of colleges has been influenced. On the other hand, if the colleges interpose the loans overmuch, the function of routine education will be trailed off. So the colleges should adjust their role in time to safeguard the loan system.

**2.3 Relationship between the loan students and the colleges**

Basis of the contract of colleges and banks, the colleges will select the scheme to press the students to pay for the loans. If the students pay for the loans on time, the colleges and the students all have got benefit. But the students do not do that or default, the colleges can increase the cost to press the students to pay for loans, or they can force to withhold the graduation certificate to press them. Of course, the colleges adopt the first scheme, their income can reduce. If the colleges adopt the second scheme, the loan students can be unsatisfied very much.

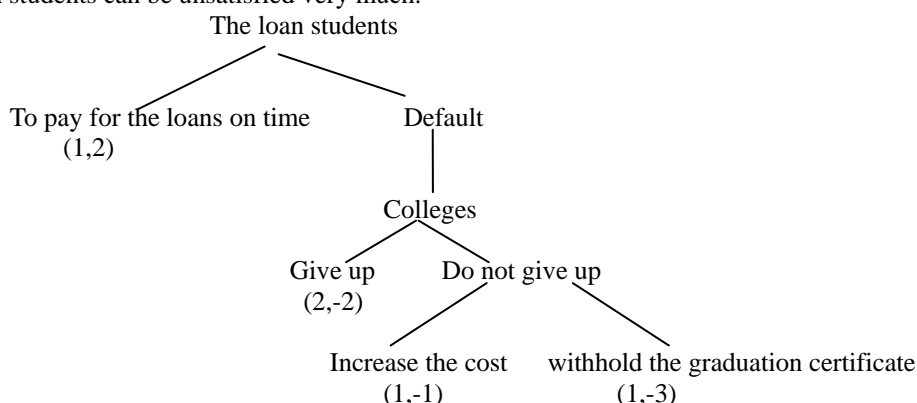


Figure 2 The Loan Students and Colleges Game Playing

**3 Analysis of the Banks' Movement System under Imperfect Credit System**

The banks cannot get the loan students' full information under the imperfect credit system. On the one hand, the banks have difficulty to forecast the future loans. On the other hand, they have difficulty to restrict the students. So the banks may face many problems which are differ from other formal loans when they carry out the business that provide the loans for the poor students.

**3.1 Difficult to exert the interest rate role of converse choice**

The interest rate has converse choice' role. The people who would like to fork out higher loans often are inclined to the higher risk. But for the government-subsidized student loan, the interest rate just can influence the students' choice between the saving and consumption. The interest rate is not the premise to apply the loans. So it is difficult to depend on the interest rate to evaluate the students default risk.



**3.2 Difficult to exert the loan amount to judge default**

When the loan amount is bigger, the default probability is bigger. But the loan amount that the country supports the students to study is finite. If the students cannot get more loan, the banks have difficulty to become aware of the students whether they are ready to default or not.

**3.3 Difficult to exert the signal indication**

It is difficult for the loan students to find a way to communicate with the banks which make the banks believe they can pay for the loan on time. The government-subsidized student loan has aimed at the poor student. If the information of these students is incomplete, the banks have no way to differentiate the loan students risk. So the government-subsidized student loan can't carry out effectively under the imperfect credit system and lacking of the signal indication.

**4 The Dealing Model of loan Students under the Perfect Credit System**

The relationship between banks and loan students becomes obscure under the imperfect credit system. So only to establish and perfect the credit system, the relationship will become clearly with the information publicity.

The loan students will consider to pay the loans on the saving, or to distribute the loans on the saving and consumption in order to realize the maximum utility. (Geoffrey A.Jehle )<sup>[4]</sup>If they pay the loans all on the saving, they get the income:

$$R = B(1 + r) \tag{1}$$

If the students distribute the loans on the saving and consumption, we can get :

$$U = \int_{t=0}^{\infty} e^{-\rho t} u(C(t)P(t)) dt \tag{2}$$

$$u(c(t)) = \frac{c(t)^{1-\theta}}{1-\theta} \tag{3}$$

$C(t)$  is the consumption of the students who have loans at  $t$  time;  $u(\cdot)$  is the instantaneous utility function;  $\rho$  is the discount rate;  $\theta$  is the risk abhorrence relatively coefficient;  $P(t)$  is the number of obtaining the loans at  $t$  time. At the same time assuming the loan students are homogeneous.

The budget restriction of the loan students:

$$\int_{t=0}^M e^{-R(t)} C(t)P(t)dt \leq w_1 + \int_{t=0}^M e^{-R(t)} B(t)P(t)dt \tag{4}$$

$w_1$  is the income summation of loan students;  $B(t)$  is the surplus after the students put all the wealth on the consumption, that is  $B(t) = Y(t) - C(t)$ ;  $R(t) = \int_{\tau=0}^t r(\tau)d\tau$ ; At the same time assuming that students can get loans every year.

According to(2)and(4):

$$\Gamma = \int_{t=0}^{\infty} e^{-\rho t} u(C(t)P(t))dt + \lambda[w_1 + \int_{t=0}^M e^{-R(t)} B(t)P(t)dt - \int_{t=0}^M e^{-R(t)} C(t)P(t)dt] \tag{5}$$

Derivative  $C(t)$ , then ordering  $C(t)' = 0$  can get:

$$e^{-\rho t} c(t)^{-\theta} = \lambda e^{-R(t)} \tag{6}$$

The loan student wanting to realize the maximum utility must consider the future discount rate and interest rate under budget restriction. Furthermore, they must think of the opportunity cost. If they are ready to default, they get income 2, but they may lose to obtain other loans possibility. If they pay for the loan on time, they get income 1, but they obtain the chance to increase fame investment.

The analysis is based on the assuming that all the students are homogeneous. In the realism, every student consider the risk and opportunity cost with different visual angle, the difference of their behavior also is big. But the credit system is perfect, the students rational choice will be consistent.

**5 The Credit System Innovation**

### **5.1 To increase the students signal indication**

When the different borrowers who have different risk inclination get together, it is difficult for banks to differentiate them. If the banks choose the higher balanced level, the lower risk borrowers will be drove out of the loan market. If the banks choose the lower balanced level, their income will be suffered. So the lower borrowers must adopt some measures to promote the banks to believe their risk degree, the balance may be realized between banks and borrowers.

It is premise of signal indication to find out the information about the government-subsidized student loan. At present, many students learn the information about the government-subsidized student loan very little. They just have been notified to prepare series datums. If the necessary information is imperfect, the students may lose the judgment about cost and income. They don't know what measures they should adopt to protect their maximum rights and interests.

It is key of signal indication to judge the risk inclination rationally for students. Different students have different risk preference. Students should judge their risk degree accurately and they should learn to judge the opportunity cost. The consider between future return and present cost can influence the risk choice for students.

The important gist for banks to offer loans is the signal indication game playing of students. On the one hand, the lower risk borrowers depend on the more rigorous condition of loans, more rigorous items, and lower return to show their risk preference through signal indication. On the other hand, the banks can learn the default probability about students through the signal indication game playing. So the banks can look for the lower risk borrowers from these different default probability.

### **5.2 To establish perfect credit system about the loan students**

The foundation for the government-subsidized student loan is that the colleges should establish perfect credit system. So the credit datums about loan students should include three factors.

The first factor is the moral endowment about loan students. The moral endowment about students is the kernel of credit system. Because the moral restriction is higher than the economy restriction for most students, the colleges must hold the moral endowment fully about these students including personal quality, moral attitude, honesty and keeping faith, etc. According to the basic moral endowment, the colleges can establish the students personal credit system.

The second factor is the family income. The family income amount is the most important factor for poor students to apply the loans, and the important factor to pay for loan on time. After graduating from schools, the students may pay more income on the family to help family develop, and the fund for repaying loans may not be in place because of the more consumption on the family. So the colleges not only must know the family income of having loans students, but also consider all the factors to deal with loans rationally.

The third factor is the school work and the work ability of students. The school work and the work ability influence the employment, work income and the choice of repaying loan. So to grasp these information is the key for establishing credit system about loan students.

### **5.3 To establish the credit information bank**

The banks must have full information in order to safeguard the information symmetrical. So to constitute the information bank can resolve the restriction of loan students well. For the default students, the banks should put the badness credit record into the personal information bank, and deprive them to obtain the loan again. From the point of view, the banks can reduce the management risk, and the poor students can finish their studies between the cost and income trade-off.

## **6 Conclusion**

When students get loan, they often hesitate between the cost and income. The colleges and the banks will increase the cost and management risk because of imperfect information about the loan students. So to innovate the credit system, students, colleges and the banks all can benefit. At the same time, the students, colleges and banks should adopt measures to promote this innovation.

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# Exploring Effect of Service Innovation on Business Performance of Restaurants in India

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**Abstract** :Restaurant business in India has witnessed exponential growth. Objective of this paper is to examine possible relationship between innovativeness, effectiveness and efficiency of a restaurant. For this study, data were collected from 175 restaurants. To conclude, this paper identifies important relationships between operational effectiveness, business performance and innovations in service delivery.

**Keywords**: Operating effectiveness; Business performance; Service innovation; India; Restaurants

## 1 Introduction

Restaurant business is one of the oldest and most evolved business, as observed all over the world. In the current Indian context of increased globalization, changing taste of younger generation and better affordability due to rapid economic growth, restaurant services have seen substantial growth in the recent years and there is tremendous scope for improvement in service design and operations. Recent research has suggested that innovativeness contributes to business performance (Deshpande et al., 1993; Hult et al., 2004; Hurley, 1995; Tajeddini et al., 2006). Innovation plays a major role in formation and execution of business strategy, due to its impact on profitability and differentiation. In addition, a large number of prior studies concerning innovativeness have been conducted in different firms focusing on products and processes (Tajeddini, 2010).

However, even though the services sector has become a tremendously large part of the modern economy (Lee et al., 1996; Oldenboom and Abratt, 2000), empirical research related to services seems to be quite insufficient in empirical economics and innovation research (Hollenstein, 2000). More precisely, we have little knowledge regarding the effect of innovativeness upon the companies that provide services to the consumer, such as restaurants, hotels and leisure (Tajeddini, 2010).

In an economic system as in India, where growth is in double digits year after year, not much work has been done to co-relate operating effectiveness and innovation in the service industry.

On one hand, there are many well-established multi-national restaurant chains with great marketing, personnel, financial, and other resources. On the other hand, changes in customer tastes and dietary habits as well as national, regional and local economic conditions and demographic trends have made the restaurant industry intensely competitive. Therefore, the present study's emphasis is on providing restaurant managers with more understandable guidelines on innovativeness, efficiency and business performance.

The paper begins with examining plausibility of innovativeness, efficiency and offers a collection of associated hypotheses. In the methodology section, the study sample of restaurants is discussed and the construct measures are evaluated. Next, the relationships among these constructs are assessed and discussed to reach conclusions.

## 2 Background

### 2.1 Innovativeness

Innovativeness is conceived as one of the avenues to gain a competitive advantage (Clemons and Row, 1991; Deshpande et al., 1993; Edwards et al., 2002; Hult et al., 2003; Hurley and Hult, 1998; Martins and Terblanche, 2003; Nieto and Quevedo, 2005; Olson et al., 2005; Salaman and Storey, 2002; Sandvik and Sandvik, 2003; Tajeddini et al., 2006; Tajeddini and Trueman, 2008).

In general, innovativeness has been defined as an organisational culture that encourages the introduction of new processes, products, and ideas (Hult et al., 2003, 2004; Hurley and Hult, 1998), and the creation of new products, services, and technologies (Antoncic and Hisrich, 2001).

From a service perspective, some marketing and management authors have defined innovativeness as the degree of newness relative to the outside world and the firm itself (Kleinschmidt and Cooper, 1991; Olson et al., 1995; Olsen and Sallis, 2006). Similar to product innovativeness, simply introducing a new

service is necessary but not sufficient as an indication of innovation; that is, an innovative product or service must also be unique in its market (Holbrook and Hughes, 1998). However, some scholars (Atuahene-Gima, 1996; Oldenboom and Abratt, 2000) argue that the lack of planning and informality have forced service organizations to rely heavily on competitive imitation and/or customer canvassing to foster new ideas.

Despite the growing interest in service and innovation, no strong consensus has formed about the innovation process for service firms. Perhaps it is because service innovation was perceived as a contradiction in term (Dolfsma, 2004). Part of the perception may be associated with the lack of applicability of the methods measuring innovation for products to the heterogeneous group of sectors such as service industries (Dolfsma, 2004; Kleinknecht, 2000). Moreover, while a large number of innovation strategy scholars have developed theoretical models and embedded concepts to understand processes of product innovation, the possibility of applying them in the context of service industries is in question (Dolfsma, 2004; Sundbo, 1997; Tajeddini, 2009, 2010). On the other hand, a constantly changing environment, highly demanding customers and intensive global competition characterize today's service climate.

Hence we witness customers' needs and perceptions of service firms are constantly changing.

In this regard, Chang et al. (1999) conclude that it is crucial to regularly appraise one's competitive status and make appropriate decisions on required modifications to offerings and marketing campaigns. Therefore, it is not surprising that innovative companies continuously investigate various means of improving the quality of their offerings and enhancing sustainable superior value for their customers. To achieve this objective, organizations must search for new ideas, adopting open search strategies that involve the use of a wide range of external actors and sources to help them achieve and sustain innovation (Laursen and Salter, 2004).

## **2.2 Innovativeness and Effectiveness**

The current environment is characterized by time-based competition, wherein increasingly impatient customers favor providers that offer speedy delivery of a quality product or service (Hult et al., 2004). Alignment to the market, through capturing the voice of the customer via quality function deployment (Jaraiedi and Ritz, 1994; Madu and Kuei, 1995), improving market information processing (Ottum and Moore, 1997), increasing market and learning orientation (Tajeddini, 2009), and modernizing technology are recognized as influential factors for explaining quality improvement.

Porter (1980) observed that operational effectiveness are any organization's skill sets or "core competencies" which must fit and work together to implement the strategy. Ren et al. (2006) argue that taking the risk of investing in innovation may be a means of ensuring longer term strategic flexibility, thereby securing operational effectiveness. Furthermore, it is accepted that innovative organizations need to be ahead of what customers want and enjoy a greater operational efficiency due to the quality offered and better satisfaction. In return, customers will perceive the firm's service offerings as being of premium quality (Chang et al., 1999).

This perception improves the effectiveness of a firm's operation and leads to customer satisfaction.

This leads to the first hypothesis:

*H1. There is a positive relationship between innovativeness and Operational Effectiveness.*

## **2.3 Operational Effectiveness and Business Performance**

Chang et al. (1999) argue that operational effectiveness yields higher quality and customer loyalty and leads the organizations lowering costs and retaining competitive advantage in price. Similarly, by creating the strategy/operational effectiveness dichotomy, Porter (1980) argues that a firm can improve performance if it learns how to reduce defects in products or develop better products faster.

Hence the following hypotheses are posited:

*H2. There is a positive association between OE and business performance measured by: (a) service quality; (b) customer satisfaction; (c) overall customer service level.*

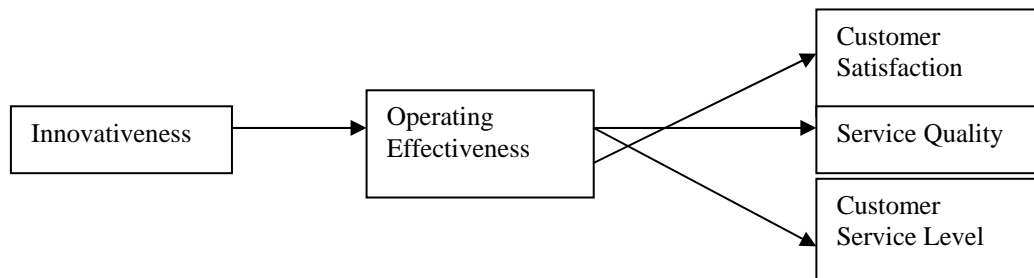
The overall conceptual model indicates that innovativeness leads to greater effectiveness.

# **3 Methodology**

## **3.1 Data collection and procedure**

A questionnaire was designed to ask businesses for their perceptions on a range of organisational variables including the nature of innovativeness, Operational Effectiveness, and business performance. The questionnaire was pretested in order to ensure that the survey content and measurement scales were clear, valid and appropriate.

Based on the pre-testing results, it was determined that restaurant managers and owners were the most qualified to provide the required data because they were primarily responsible for the overall operation. Based on responses from the pre-test, the survey instrument necessitated no significant changes. Interviews with selected general managers helped ensure the content validity of the measures. In this study participants consisted of 175 restaurant owners/managers from four major destinations located in National Capital Region of India (New Delhi, Noida, Gurgaon and Ghaziabad). In order to collect the data, the procedure of Kara et al. (2005) was followed.



**Figure 1 The Conceptual Model**

Therefore, all of the participants were recruited randomly on the basis of convenience, and all participated voluntarily.

Data were collected through personal interviews after contacting each organization and seeking permission to collect data. In face-to-face interviews all of the respondents were guaranteed anonymity for themselves and their companies and were promised an offer of a report of the results as an incentive to participate in the study. The survey process consisted of two or more visits to the businesses. In almost all cases the first visit consisted of leaving the survey with the owner/manager for them to complete. In the second, follow-up visit, questions were answered and the completed survey was collected (Kara et al., 2005). Data were normally collected during business operations; however, sometimes it was necessary to collect the completed surveys while the business was closed or at a convenient time that met the business owner's schedule. Finally, a few open-ended questions were added to give "color" to our data and lead the respondents to think analytically and critically.

### 3.2 Measures

All measures were drawn from previous research and aligned with the conceptual aspects of each construct. Innovativeness was quantified using the five-item scale frequently used by Hurley and Hult (1998), because it incorporates management opinion about receptivity to new ideas and innovation (e.g. Management actively seeks innovative ideas). To measure OE, the scale of SERVQUAL scale (Parasuraman et al., 1988; Zeithaml et al., 1990), using a five-point Likert scale, was adopted due to its ability to assess a general class of services. Its concept and operation are based on a gap theory and its 22-item scale was built along five components:

- 1) Tangibility;
- 2) Responsiveness;
- 3) Reliability;
- 4) Accuracy; and
- 5) empathy.

Business performance uses three perceptual measures derived from Kara et al. (2005), namely profit goal achievement, sales goal achievement and return on investment (ROI) achievement (e.g. for the last three years profit goals have been achieved). Table I provides some information about the respondents' demographic characteristics as well as their organisational characteristics.

### 3.3 Analysis and results

The reliability analysis of the measures utilized for the multi-dimensional constructs was conducted by utilizing Cronbach's coefficient alpha (Churchill, 1979). The overall coefficient alpha score for each construct suggests a high level of reliability since in each case the value is greater than the suggested cut-off level of 0.7 (Nunnally, 1978). The innovativeness and SERVQUAL scales were first scrutinized for reliability. The Cronbach's alphas are 0.81 and 0.78 and Guttman's split-half reliability coefficients 0.81 and 0.76 for the innovativeness and SERVQUAL scales, respectively.

Assessment of the content validity of the innovativeness and SERVQUAL scales was based on a qualitative exercise. The two main characteristics were: the extent to which scale items depicted the

construct's domain, and the thoroughness with which the construct to be scaled and its domain were articulated (Parasuraman et al., 1988). The procedures observed by the authors whose constructs were utilized in this study are congruous with the recommendations of Churchill (1979) for developing psychometric marketing scales.

Furthermore, for this research, face and content validity checks were performed on the SERVQUAL and innovativeness measures to confirm that the dimensions would be understood by the sample and reflect the theme that the items were designed to capture. These checks were performed with the restaurants' owners and managers as well as with academics with expertise in small service business management. Correlations between innovativeness and service quality components are provided in Table 1.

**Table 1 Correlation Matrix with  $p < 0.01$**

	SERVQUAL	Tangibility	Responsiveness	Reliability	Accuracy	Empathy
Innovativeness	0.64	0.44	0.32	0.47	0.52	0.41

### 3.4 Test of hypotheses

H1 proposed a positive relationship between innovativeness and effectiveness. The result of a regression analysis reveals that effectiveness has a significant effect on all three of the measures: service quality; customer satisfaction and overall customer service level ( $p, 0.05$ ; Table 2). An overall measure was computed using factor analysis based on the three individual measures. A subsequent regression analysis shows that innovativeness has a significant association with the overall effectiveness measure ( $p, 0.05$ ). Therefore, it can be concluded that there is a positive relationship between innovativeness and operational effectiveness. In other words, an innovative restaurant is able to yield greater effectiveness.

**Table 2 Innovativeness and Effectiveness**

Dependent Variables	Independent: Innovativeness	
	Standardised b	p-Value
Overall Service Quality	0.36	<0.05
Customer Satisfaction	0.36	<0.05
Customer Service Level	0.23	<0.05
Overall Effectiveness	0.33	<0.05
Sample size	175	<0.05

According to H2, operating effectiveness has significant effect on business performance. It positively affects profit goal achievement and ROI achievement (two of the three performance measures) (Table 3).

The results generally suggest that effectiveness positively influence business performance.

**Table 3 Business Performance and Operating Effectiveness**

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## 4 Analysis of Results

The research data supports both the hypotheses. First, innovativeness has a positive effect on Operating Effectiveness. Specifically, innovativeness shows a strong association with service quality as measured by the SERVQUAL scale.

Effectiveness, in the long run, positively affects profit goal achievement ( $p$ -value, 0.01) and ROI achievement ( $p$ -value 0.05) as two indicators of the business performance.

## 5 Conclusion and Implications of Business

The objective of this research is to examine the extent to which innovativeness has an effect on restaurants' performances. The findings present a fresh insight by exploring the effect of innovativeness on operating effectiveness (e.g. service quality) and how this driver affects the performance of restaurants.

The research results offer several important managerial implications. First, the present study evidently shows a positive effect of innovativeness on effectiveness, suggesting that there are some advantages to embracing innovativeness. For example, innovativeness results in productivity and quality gains, and may also contribute to profit goal achievement. At the same time, it may also yield a more cost-efficient operation by achieving higher productivity and generating more sales from each employee (Chattopadhyay et al.,2011). Since many service firms investigate how “quality consistency” and “innovation” could have contributed to a sustainable competitive advantage in business, the findings of this study reveal that restaurants seem to have evolved towards a more competitive position and are likely to enhance their business performance. This is consistent with findings of Hult et al. (2004, p. 436), who state that “innovativeness is likely to be useful for allowing the firm to pre-empt competitors with new or improved products, diversify product lines, and generally expand the firm’s scope of activities”. As a result, innovativeness is critical for businesses and is regarded as a factor which might contribute to achieving sustainable competitive advantage.

This study highlights the importance of managerial emphasis on the creation of an internal business environment contributing to innovative activities, superior service quality and greater productivity. Specifically, superior productivity and advanced service quality were found to have a significant and positive impact upon restaurant business performance in the long term.

The findings of this study can help the relevant stakeholders of modern day restaurants to promote innovation among employees and other possible stakeholders. This study can reveal to the restaurant owners the impact of innovativeness on the operational performance of restaurants and also to put in necessary initiatives to close the gap between the service quality perceptions and expectations.

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# Application of the “737355” Differentiation Mode to the Talents Training Programs in Higher Vocational Education

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**Abstract:** The “737355” differentiation mode to talents training is an important component of the differential developmental strategy for vocational colleges. If vocational colleges want to win in the increasingly fierce competition, they must make dramatic reforms in such aspects as training programs, curricular system, teaching content and teaching methods, and create a differential training mode that will suit the needs of higher vocational education and differ from the undergraduate education mode so that they can yield twice the result with half the effort.

**Key Words:** Higher vocational education; Training mode; Differentiation; Exploration

## 1 Introduction

Unlike undergraduate education which stresses academic disciplines and aims at training academic researchers, higher vocational education, in accordance with occupational classification, intends to train high-level practice-oriented talents who will work at the forefront of production, construction, management, and service, to meet the actual needs of certain occupational positions (groups). Therefore, the most important criteria for measuring the success of a vocational college are the popularity of its graduates with the society and employers, and the employment rate as well. These criteria are also the starting line and the destination on which higher vocational colleges should focus their attention in the talent training mode reform. Currently, higher education is flourishing and the competition is becoming increasingly severe in China. Under the circumstances, higher vocational schools must differentiate themselves from undergraduate colleges and make a radical reform in the talent training mode to establish a differentiated training mode suitable for higher vocational education and then win out of the game.

## 2 The Nature and Features of the Higher Vocational Education Training Mode Differentiation

### 2.1 The nature of the higher vocational education training mode differentiation

A talent training mode is generally regarded as the structural style and the operation mode of a training process adopted to achieve the talents training objectives, and it mainly consists of curriculum system, teaching mode, teaching design, educational methods, etc.

The differentiation strategy first appeared and prevailed in the business world, then was widely introduced to such institutional and social organizations as schools, hospitals, and research institutions, and now has become a management strategy responsive to the needs of our times. Michael Porter, a famous professor at Harvard University, defined the differentiation strategy as a unique strategy that can differentiate an agency's product or service so that it is perceived industry-wide as being unique.

In accordance with the meaning of the talent training mode and the definition of the differentiation strategy, the author proposes that the higher vocational education training mode differentiation is the structural style and the operation mode of the training process which is different from that of undergraduate education and which aims at training high-level practice-oriented talents who will work at the forefront of production, construction, management, and service. It is a non-academic and competence-based higher vocational education mode consisting of curriculum system, teaching mode, teaching design, and educational methods.

### 2.2 The features of the higher vocational education training mode differentiation

The intrinsic feature of higher vocational education is to train high-level practice-oriented talents who will work at the forefront of production, construction, management, and service. Occupational pertinence or employability is its essential attribute. In accordance with the characteristics of higher vocational education and the nature of the higher vocational education training mode differentiation, the author argues that the main features of the higher vocational education training mode differentiation are reflected in the following aspects:

First, its basic task is to train high-level practice-oriented talents.

The major educational function of vocational colleges is to train high-level practice-oriented talents, and they have both the attribute of higher education and that of vocational education. Thus the higher vocational education training mode must be subordinated to the objective of higher vocational education training, which is to train those who can not only master the basic knowledge and qualities offered by higher education, but also possess the occupational skills and professional qualities necessary for future occupations. Employment-oriented training therefore is the intrinsic feature of the higher vocational education training mode.

Second, it develops training programs by focusing on cultivating the ability to put technology into practice.

Higher vocational education aims at training high-level practice-oriented talents who are different from the interdisciplinary ones and who will work at the forefront of production, construction, management, and service. Therefore, vocational colleges should adapt themselves to the needs of the society, and design training programs by focusing on cultivating the ability to put technology into practice, so that their graduates can master moderate theoretical knowledge, remarkable abilities to apply technology, a wide range of knowledge, and high occupational qualities.

Third, it builds the practice-oriented system of curriculum and teaching content.

Higher vocational education set the training of practice-oriented talents as the primary objective. Quite unlike undergraduate education which stresses academic disciplines and aims at training academic talents, higher vocational education requires students to master moderate theoretical knowledge but great practical skills. Thus, higher vocational education does not require students to learn knowledge as comprehensively and systematically as undergraduate education does. Instead of stressing the breadth of fundamental theories and professional knowledge, it attaches great emphasis on professional skills and requires students to have an excellent mastery of practical skills. Therefore, the most significant feature of the higher vocational education training mode is to build the system of curriculum and teaching content in accordance with the requirement of future occupations which is to master moderate professional knowledge and excellent practical skills.

Fourth, practice teaching takes up a large proportion in the training program.

Teaching-oriented and research-oriented universities put emphasis on cultivating students' innovative thinking ability and the ability to put knowledge and technology into practice, and focus on training students in applying their theoretical knowledge to technological innovation and the development of new technology. Although vocational colleges also put their focus on students' ability to apply technology, this kind of ability refers to the skill or technique to use mature technologies that have already formed technical specifications, rather than the capacity for technological innovation and new technology development. Therefore, vocational colleges should pay more attention to training students' practical skills than undergraduate colleges, and the proportion of practice teaching in the teaching program in vocational colleges should also be larger than that in undergraduate colleges.

Fifth, it adopts a combination of production and teaching as a basic approach to talents training.

The combination of production and teaching in talent training is in line with the essential requirement of higher vocational education. First, the combination of production and teaching is conducive to the achievement of higher vocational training objectives; second, the combination is conducive to the specialty setting of higher vocational education; third, it is conducive to improving the quality of higher vocational teaching; fourth, it is conducive to the training of double-qualified teachers at vocational colleges; fifth, it is beneficial to graduate employment by improving the employment rate. Vocational colleges must adopt the combination of production and teaching as the basic approach to running and developing the schools, and promote a new talent training mode that is motivated by the collaboration between schools and companies, between teachers, students and workers, and by the combination of classroom teaching and the production site, of theory and practice.

### **3 The Assumptions of the Differentiation in Higher Vocational Education Training Mode**

Vocational colleges should orient themselves towards employment, identify the point of market entry with scientific and rational positioning, and focus on training high-skilled practice-oriented talents with innovative capacities and entrepreneurial spirit. They should also establish the concept of quality and innovative education centering on the trinity of knowledge teaching, capacity training, and quality improving, and commit themselves to the formation of a distinctive talent training mode.

#### **3.1 Differentiation in talent training program**

The innovation and differentiation of higher vocational education training mode should start with the differentiation in talent training programs. Vocational colleges should consider students foremost, take competence training as the foundation, and focus on bridging the gap between the theory and practice and the gap between curricular and extracurricular activities, and discard the traditional three-stage mode employed in undergraduate education. They should also strive to comprehensively improve students' professional qualities, mastery of knowledge, and formation of basic capacities, and to train high-level practice-oriented talents who will work at the forefront of production, construction, management and service.

### **3.2 Differentiation in curriculum system and teaching content**

The objective of higher vocational training should be to train students to master moderate basic professional knowledge and excellent professional skills, and to build the competence-oriented curriculum system and teaching content. Therefore, traditional teaching concept which emphasizes an comprehensive and systematic way of mastering vertical knowledge should be discarded. The curriculum system and teaching content should shift focus from academic subjects to the needs of employment. In addition, vocational qualification training and course teaching should be integrated so that students can obtain two or more certificates at school, which will better prepare them for future occupations.

### **3.3 Differentiation in the way of training**

Vocational colleges should adhere to the methods of "order training" and "occupation-targeted training", namely, training talents in accordance with orders and training them in vocational skills required by occupations. Schools and companies should decide the training programs as soon as students enroll in the schools. Schools should work in strict accordance with orders, and the companies should comply with the two-way selection mechanism and give preference to those qualified graduates for employment.

### **3.4 Differentiation in training method**

Chinese higher vocational education should learn from the dual education system practiced in Germany to create a unique dual education system, the core of which is to closely combine theoretical knowledge taught at school with practical skills trained at companies, and to strengthen students' vocational qualities and skills. Moreover, the proportion of the hours of theoretical teaching to those of practical skills training should be no less than 1:1. Thus, vocational schools should rely on companies and make full use of modern equipment and latest technology to enhance students' vocational skills.

### **3.5 Differentiation in training focus**

Teaching-oriented and research-oriented universities should commit themselves to fully improving the overall qualities of students, including scientific, cultural, moral qualities and the spirit of innovation. Although vocational colleges should also educate students for all-round development, it is unnecessary and impossible for them to compare with undergraduate colleges. Their focus is to train students in vocational qualities, including dedication, hard-working, discipline, and innovativeness, which are necessary for performing their duties in work. So, to cultivate "professional employees" is the crucial part for higher vocational education.

## **4 To apply 737355 Training Mode and Adopts a Combination of Production and Teaching Are Effective Ways to Achieve Differentiation in the Higher Vocational Education Training Mode**

Chongqing Information Technology College, on the basis of a comparative analysis of the domestic and foreign reforms in higher education, together with its long-term practices in school reform, has created a 737355 Training Mode which is considered an effective way to achieve differentiation in the higher vocational training mode.

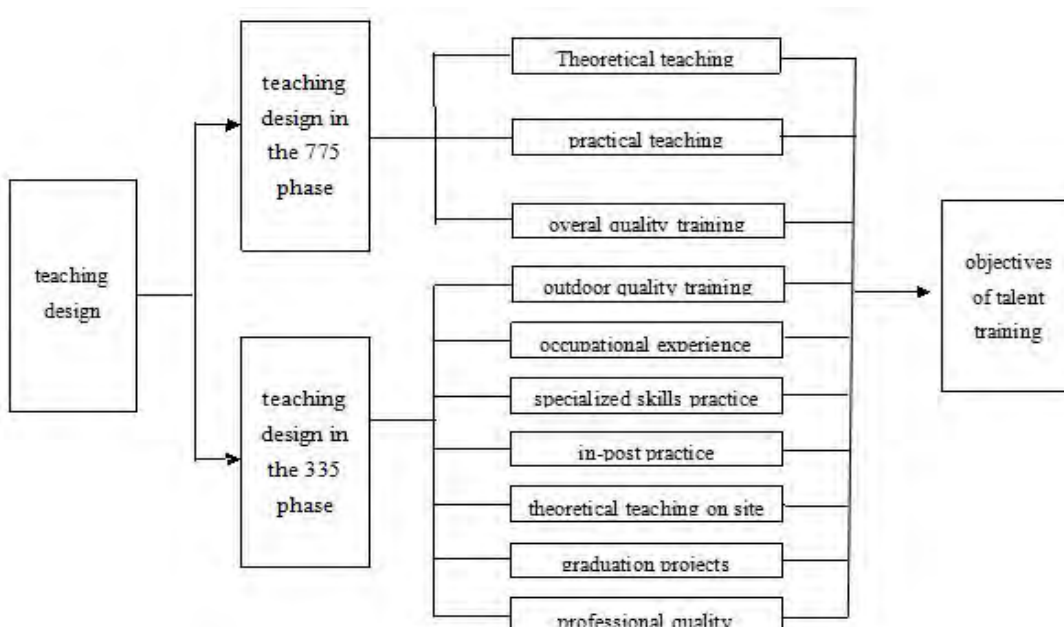
### **4.1 The nature of 737355 training mode**

Under 737355 mode which combines production and teaching, students not only receive lessons at schools but also go to companies for production practices in accordance with the training programs jointly developed by schools and companies. This new training mode is motivated by the collaboration between schools and companies, between teachers, students and workers, and by the combination of classrooms and production sites, of theory and practice. To be specific, in the first academic year, vocational students spend 7 months learning elementary courses at school, 1 month at outdoor education bases for outdoor survival qualities training, and then serve a 2-month experience apprenticeship in companies; in the second academic year, they spend 7 months learning specialized core courses at

school and 3 months practicing basic vocational skills in companies; in the third academic year, they spend 5 months learning comprehensive courses at school and 5 months practicing overall vocational skills in companies. In this year, students should also determine the titles of their graduation projects and complete the projects under the joint supervision of their teachers at school and their tutors in companies.

**Table 1 The Teaching Schedule of 737355 Mode**

teaching phase	teaching place	academic year	duration (month)	teaching or practice content
775	schools	first	7	elementary courses
		second	7	specialized core courses
		third	5	comprehensive courses
335	outdoor education bases	first	1	foster quality development
	companies	first	2	experience real work
		second	3	practice basic vocational skills
		third	5	practice overall vocational skills



**Figure 1 The Teaching Design on the Basis of School-Company Collaboration**

**4.2 The features of 737355 training mode**

First, a change from sole educational subject to multiple educational subjects

Schools used to be the subject in talent training. With the implementation of the 737355 Training Mode which is in line with the characteristics of higher vocational education, schools and companies have become the two main roles in educating students. They jointly formulate teaching plans and are jointly responsible for teaching students.

Second, a change from sole educational environment to multiple educational environments

Companies are the best places for developing students' practical abilities and overall qualities. With the implementation of 737355 Training Mode, students can not only acquire knowledge and get trained at school, but also experience actual production, management, and service in companies. Under the multiple educational environments both at school and in society, students can comprehensively improve practical skills and overall qualities, including dedication, quality awareness, service minds, cooperative sense, team spirit, etc. Student will gradually develop strong professional qualities in terms of humanistic spirit, physical and mental health by working at the forefront of companies.

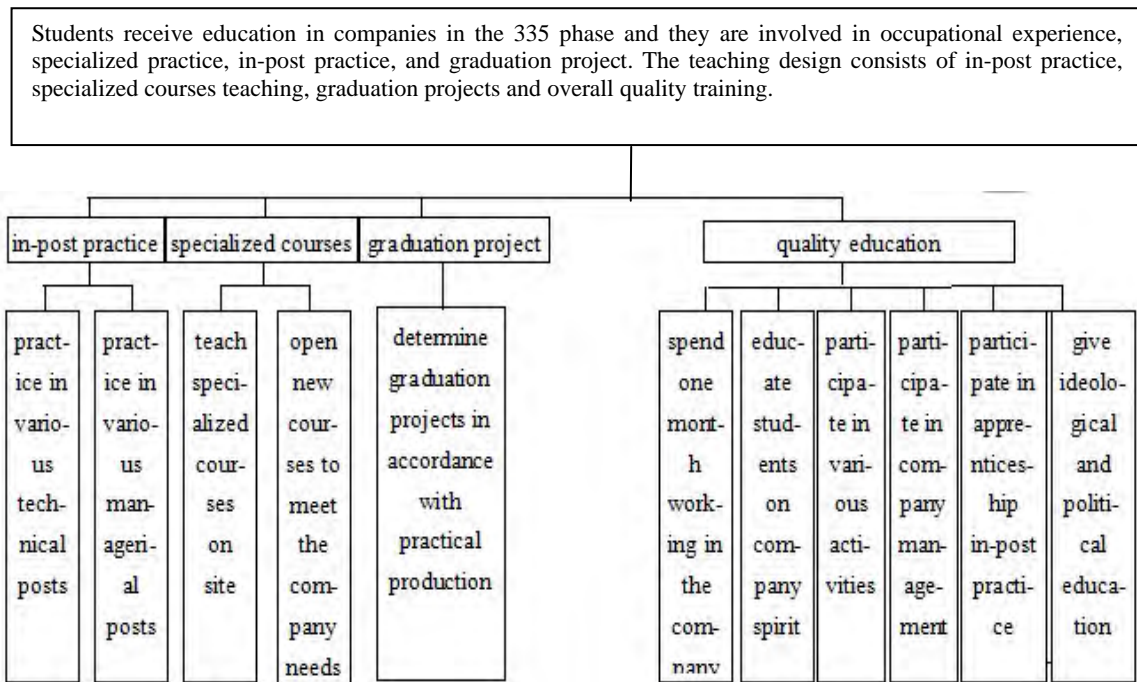


Figure 2 The Teaching Design in the 335 Phase

Third, a change in training method toward dual education

By the traditional training method centering on theoretical knowledge teaching in classrooms, theory and practice have been separated, and students tend to have a poor grasp of practical abilities. 737355 Training Mode closely combines theoretical knowledge teaching in classrooms and practical skills training in companies. It will create a dual education system suitable for higher vocational education, under which students can master good comprehensive qualities, adequate theoretical knowledge, strong professional skills, and feel at ease with the work after being recruited.

#### 4.3 The Effects of 737355 Training Mode

In order to fluently carry out the 737355 Training Mode, the college made a lot of reforms in the organization frame. We took the advantage of flexibility of a private college to adjust, expand, and optimize the function of the Board of Directions to adapt the original structure into a new system where the four parties, the government, the industry, the school and the corporations will cooperate with each other. Under this situation, the college designedly sent the students to the cooperating corporations to do their internship in the aspects of occupation, professionalization, and post practice. The college has further carried on the mode of order training, alternation of teaching and working. Also, according to the current situation of I.T., creative and modern service industries and their trends, the college has carried on the teaching-learning-practice integrated mode to let students combine knowledge and practice together and experience and learn from the real working environment.

With educational reforms of more than two years, Chongqing Information Technology College has won initial success by adopting this training mode. The significant effects of 737355 Training Mode can be reflected in the following aspects. First, it deepens the reform of school-running system. 737355 Training Mode closely links society, schools and companies, and school-running systems thus can change in accordance with social and corporate production modes and better serve the economic development. Second, it helps to enhance the professional qualities of students. According to 37355 Training Mode, students spend a month developing the quality for surviving in the wild, a process that can strengthen their professional qualities, and train them in team spirit, cooperative sense, resistance to frustration, and self-challenge. Sending students to the forefront of production enables them to withstand the test of a role change, and strengthens their will and spirit. They can learn from the industrial workers some professional qualities that cannot be learned at school such as dedication, teamwork, quality awareness, service minds and cooperative skills. Third, it helps to enhance students' practical abilities.

During the 335 phase of 737355 Training Mode, students are required to go to the forefront of production. The integration of theoretical teaching and practical education can not only effectively overcome the problem that students grow weary of learning theoretical knowledge, but stimulate students' enthusiasm for learning by arousing their interest in new technologies. It can also comprehensively improve students' ability to solve practical problems emerging during production, and provide a more targeted approach to academic study so that students can put their theoretical knowledge into practice, thereby increasing the number of students employed in occupations that suit their training.

## 5 Conclusions

To sum up, in an increasingly competitive situation where higher education flourishes, higher vocational education must adhere to the strategy of differentiated development, which is to implement differentiation in such aspects as school running, positioning, talent training mode, and management, in order to gain an advantage in achieving sustainable development. An effective way to achieve the strategy for differentiated development of higher vocational education is to choose the training mode most suitable for the objectives of training vocational students through conducting research into talent training mode differentiation.

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## Efficient Solutions for Business Operations Through Raising Questions — Q10 as a Structured Way of Thinking about Business

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**Abstract:** The Lenovo Q10 management tool is a structured way of thinking about business. When confronting problems, the staffs involved are no longer blindly reliant on experience, but rather first identify the most important problem, and then find its root cause so that they can develop and implement the best solution plan. This paper proposes the problems existing in business operations management, examines the innovations and functions of Q10 management tool and discusses its application. The paper concludes that Q10 can enhance the ability of managerial thinking, improves the efficiency of organisational operations and achieve organisational synergy.

**Key Words:** Business Operations Management; Q10; Function; Application

### 1 Introduction

During the course of corporate development, with the expansion of business organizations and the diversification of its staff, an enterprise's business is becoming increasingly complex and the execution of its strategies becomes increasingly difficult as well. These contradictions will manifest themselves in the smoothness of business operations as well as the efficiency of solving operational problems. Many enterprises have met problems with business operations. When a concerted effort is needed, inefficient coordination always occurs among the business management departments at various levels in an enterprise. Moreover, rapid decision-making at meetings often brings about poor solutions, and repeated occurrence of the same problem always drags the enterprise's business operations into a vicious circle, resulting in a devastating impact on the enterprise.

### 2 Problems Existing in Business Operations Management

The cause of the above-mentioned situation lies in a lack of a common understanding of business within the enterprise. Staff members tend to be self-centered in understanding problems and expressing ideas, leading to endless arguments over certain problems and ultimately making it difficult to reach any conclusion. Being too dependent on experience, they may hastily propose a solution, then draw a conclusion, and finally make a wrong decision.

There are a number of management theories and methods regarding how to solve the problems in this respect, such as Kaplan's Balanced Scorecard method which emphasizes the decisive role of balance in management and the Six Sigma methodology which highlights the importance of data analysis and continuous improvement. However, the problem is that it is difficult for the vast majority of employees to quickly grasp the essence of these sophisticated theories and methodologies, and quickly master the skills to solve specific business management issues.

During the course of managing business operations, many Chinese enterprises which are in the phase of rapid expansion have encountered such problems as how to achieve a unified business language so that communication can be simple and effective and a consensus can be quickly reached and how to quickly tease key issues out of vast amounts of information and thus form an action plan.

Lenovo Group Limited has also encountered such problems in its path toward internationalization. The birth of the Lenovo Q10 management tool provides great impetus for solving the above problems.

The Lenovo Q10 management tool is defined as a structured way of thinking about business which is a question-driven management tool centering on 10 questions (see figure 1). These 10 questions are in a strictly logical order, composing a logical closed loop. Under the guidance of this management tool, users, through five steps (see figure 2), can unify the logical starting point, think over the questions with a rigorous logic, quickly reach a consensus and execute the best solution. The Q10 management tool can not only help its users deal with business issues, but can also improve its users' managerial thinking ability by enhancing the five key thinking skills which are systems thinking, logical thinking, creative thinking, action thinking, and learning thinking respectively.

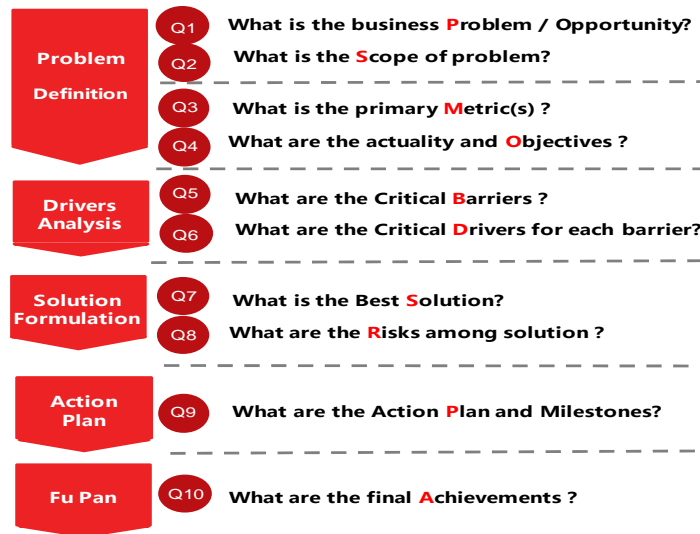


Figure 1 The Lenovo Q10

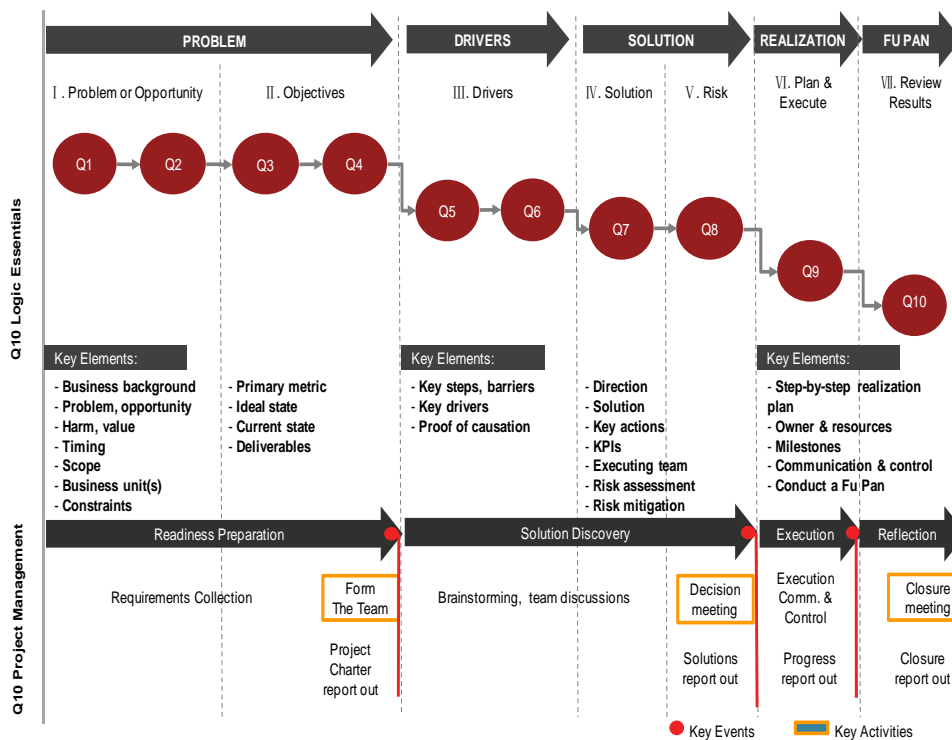


Figure 2 The Framework of the Lenovo Q10 Management Method

The Q10 management tool focuses on two fields, the first of which is about how to identify the fundamental problem influencing the business and how to enhance the effectiveness of solving the business problem, that is, “do the right things”. The other field is about how to develop effective solutions and resolutely execute the solutions to improve the problem-solving efficiency, that is, “do the things right”. Lenovo has been attaching special importance to the use of Q10 to improve the effectiveness at work.

### 3 The Innovations and Functions of Q10

Unlike other management tools, Q10 has the following innovations. First, it enhances the ability of managerial thinking rather than mere managerial skills. Its innovation is to train people's thinking ability, and to equip people with a scientific way of thinking instead of some specific management tools

confined in certain circumstances. This kind of managerial thinking, if internalized by an individual, will become a good tool of thinking and acting by changing his mode of thinking, and benefit both his work and life.

Second, Q10 can cultivate similar logic thinking abilities to avoid the conflicts generated by cultural differences. In the area of business management, holding similar modes of thinking by the two sides is an effective way to avoid cultural conflicts. This rule is applicable to people from different geographical areas both within in a country and around the world. For an enterprise that is expanding globally, this rule gives it the opportunity to reduce the impact of cultural differences on its teams that come from different countries and regions, and to facilitate the communication and integration between international teams within the enterprise.

Third, the popularity of Q10 within an organization is very important in improving the efficiency of organisational operations and in achieving organisational synergy. The use of a common language to discuss business issues at meetings can prevent arguments. Moreover, owing to the consensus on the problems and the causes, the efficiency of decision-making is dramatically improved, and a closer collaborative relationship between executors is also established. This is a characteristic that many other management tools lack.

With its growing popularity, Q10 has played a very active role in enhancing one's managerial capacity because it can

1) bring managers back to organisational rationality

When a manager makes a mistake in decision-making, people tend to believe that the manager is ill-considered, opinionated, subjective, domineering, etc. It is the irrational decision made by the manager that makes people believe so. Under the guidance of Q10, however, the manager and his teammates will think and act more rationally, and the manager is expected to shift his attitude toward decision-making from overriding all objections to pooling the wisdom of the masses. Q10 thus is the guarantee of right decisions.

2) promote organisational harmony

The basis for harmonious operations is to promote the business in strict accordance with the logical closed loop of Q10. Each participant can exert his or her strengths on a certain logical node, and enhance his or her sense of honor and identification with the organization.

3) present implicit information

When a manager uses Q10 to help his subordinates comb through amounts of information, through raising the 10 questions, he can instruct his team to consider such questions as how things are going, what kind of questions they should answer, and who the stakeholders are. Those questions are clearly presented in the logical order of Q10, which makes all kinds of information, especially the information valuable for promoting the business, presented piece by piece.

4) promote the implementation of corporate culture

Culture influences individuals in a way which goes like values - way of thinking - behavior - results. Many enterprises only concern themselves with the agreed values, but neglect the fact that changes in the way of thinking go prior to the changes in behavior. Q10 provides an effective tool for managers to change their ways of thinking. For example, as to the question of how to think clearly, Q10 provides a unified way of thinking that can go beyond mere cultural slogans and effectively promote the implementation of corporate culture.

#### **4 The Practice and Application of Q10**

Guided by these 10 questions, Q10 can shorten the duration of any meeting, encourage good teamwork, and make plans reasonable. When confronting problems, the staff involved are no longer blindly reliant on experience, but rather first identify the most important problem, and then find its root cause so that they can develop and implement the best solution plan. The following case is a typical example of Q10's application in Lenovo's business practices.

There was an occasion when some Lenovo channel sales managers reported to the general manager that the inadequate number of sales promotion materials had affected sales performance. The general manager asked the sales promotion department to solve this problem as soon as possible. The sales promotion manager drafted a plan to issue an additional 50% off sales promotion materials, and submitted the plan to the business director who doubted the high costs of the plan. He believed that an additional 50% off sales promotion materials would bring an 50% increase in the budget for issuing promotional materials, and there was no supporting data regarding how many materials were needed in

actual sales promotion and how many more materials were needed. Under this circumstance, the business director invited a Q10 promotional team who could help tease out a solution to join the project.

Following the logic of Q10, the project team started by answering Q1 which is "What is the business problem or opportunity?", and gradually carried out their discussion of the problem itself. After an in-depth discussion about the background of the problem, the business leader's demands and the problem's impact on business, the project team determined that Q1 was about how to enhance the management of sales promotion materials to meet the business needs.

When answering Q2 which is "What is the scope of the problem or opportunity?", participants defined the scope of their problem by drawing a flow chart (see figure 3), and found that the real users of sales promotion materials were the Lenovo dealers who were responsible for store sales. After discussion, they set dealer satisfaction with the number of sales promotion materials as the main measurable indicator, and used the ratio of the amount of sales to sales promotion expenses as an auxiliary indicator. After identifying the measurable indicators, the project team, through research and statistical analysis, then determined Q4 which is about the status quo and the objective of the indicators, that is, the main objective of the project was to raise dealers' degree of satisfaction with the number of sales promotion materials by 20% from 3.2 to 3.8.

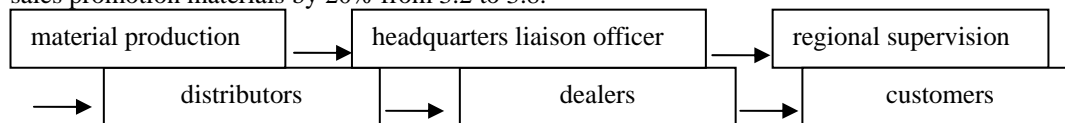


Figure 3 The Sales Promotion Materials Distribution Process

With dealer satisfaction becoming the focal point, the project team began to answer Q5 which is "What are the critical barriers?", and Q6 which is "What are the critical drivers for each barrier?", in order to find the root factor affecting the achievement of the objective.

Through analysis of Q5, the project team found that the unreasonable distribution of sales promotion materials had resulted in two types of low-degree satisfaction with material distribution. On the one hand, the inadequate number of promotional materials had resulted in low-degree satisfaction with the number of materials. On the other hand, even though the promotional materials had been adequately distributed, the dealers remained unsatisfied. One reason was that the promotional materials of various kinds were distributed far too frequently. Moreover, the huge number of dealers, as well as the negligent supervision of regional managers over distributors, led to the situation where a number of promotional materials had not been distributed timely, and some had even been left in warehouses by the distributors. The other reason was that the designing of sales promotion materials needed to be improved. The poor applicability of the designed materials prevented the distributors from distributing the promotional materials. For example, some dealers' stores were too small to use the uniform-sized promotional banners issued by the headquarters.

Based on the above findings, the project team eventually worked out Q7 of "What is the best solution?". The solution aimed at improving the designing of the promotional materials, enhancing the supervision over the distribution process and maximizing the efficiency of distribution. The solution also focused on the use of means of information technology to develop a new webpage for informing all regions, distributors and dealers of the latest materials. What matters most is that dealers, after receiving the materials, needed to confirm the types and quantities of received materials via the webpage, in order to give their feedback on the applicability of the promotional materials.

To ensure the desired effect of the solution, the project team assessed the risks of the solution by answering Q8 which is "What are the risks associated with selected solution?". The team used the risk matrix to rank the three key risks, and designed a risk avoidance strategy. In the wake of the risk assessment process, the project team developed a detailed implementation plan which included the development of the information system, the adjustment of the distribution ratio, the improvement of the management mechanism and so on, by answering Q9 which is about implementing the plan and about monitoring the key points of the implementation process.

Six months after the beginning of the project, the project team answered Q10 of "What are the final achievements?". According to the survey results, the degree of satisfaction with the number of promotional materials had surpassed 3.8 and reached 4.05, a level achieved with no increase in promotional expenses. Q10 had saved an ineffective input worth several million. More important, it had effectively improved the sales performance by determining the root of the problem.

## 5 Conclusion

As an effective management tool, Q10 plays an important role in solves the problems existing business operations management. It is a good tool to change the usual mode of thinking. However, the goal of changing the usual thinking mode of business managers and employees cannot be achieved overnight, which means that Q10 can only bring a gradually-advanced change to enterprises. The core of the problem is to persuade the staff, especially the managers at all levels to accept, apply, and spontaneously popularize this management tool among their team members.

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# Innovation of Social Management in China: A Perspective of Positive Nationality Mentality

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**Abstract:** The paper based on the national psychological problems which under the China's current social management, applying positive attitude of national horizon to probe the social management innovation. The positive national mentality is important in social management, it's the social psychological foundation of producing social management effectiveness, it can prevent and reduce the social risk, promote social harmony and stability, and it's also the aim of the social management. Finally the paper put forward some new ways of social management innovation, like construction of advanced culture, national mentality monitoring, the construction of persuasion system, the creation and perfection of social management, the construction of social management team and the cultivating and shaping the positive national mentality and so on.

**Key words:** Positive national mentality; Innovation of Social Management; System theory

## 1 Introduction

In the high speed development of economy society, in the modern countries "growing pains", the national psychology and social management innovation become the important subject and mission of contemporary Chinese academic research.

Since the reform and opening up, because of the high-speed development, the sharp and profound changes from the economic structure to the way of life have an all-round, high density of strong impact to national psychology and national mentality. Chinese national should digest and bear the social adapting pressure and experience the psychological transformation in 30 years as the westerner in 100 or even longer time. Such great contrast bring the public's pressure of psychology unbalance times of superposition. It needs the whole society to finish the psychological deconstruction and mentality reconstruction which is extremely hard together, china is experiencing the "growing pains". It's the period that all kinds of deep social contradictions highlight, it's also the period that social management become more difficult day after day, and become more difficult to coordinate the relationship of interests. The way and pattern of single social management which under the unit system society can not adapt to the contradiction and risk of the multiple society, social management innovation to be strengthened.

At present, there are only a few researches about national mentality combination with social management innovation, just in several pieces of sporadic articles. Ai Yiwei put forward the public psychological is the important ideas to strengthen the social management innovation; Liu Mingwei present the social management innovation ability should start from "heart", its value is fostering good social mentality; and Ma Xianxin proposed the social management should be paid close attention to the construction of mentality, and try to reflect fairness and justice and to construct the rational spirit.

The paper plan to theory discuss which is based on the national psychological problems which under the china's current social management, applying positive attitude of national horizon to probe the social management innovation, so to find another way to optimize the social management effect.

## 2 National Mentality and Positive National Mentality

For the national psychology, scholars pay attention and explore from different angles. About the concept definition, the famous sociologist Shao Daosheng put forward "national mentality is a 'combination' of regard, emotion and behavior of a country's social members in certain social development period, it's "the sum" of psychological reflections of social existence by the national<sup>[1]</sup>. As the reflection of social existence, the national mentality is both direct connected with economic social development and influenced by social history and culture.

The positive is index of positive psychology. So "Positive national mentality" can be concluded a concept about the positive character and positive mentality of the nationals. It's a collection of the nationals' emotion tendency, behavior tendency and understanding tendency which are positive, and follow history current in an age. The former chairman of American Psychological Association,

psychology professor of University of Pennsylvania and one of positive psychology movement advocates Seligman mentioned in Structuring human advantage: be psychology forgotten mission in 1998, there are three missions of psychology: to study the negative psychology to treat the human spirit or psychological disorders; to enable human to live more abundant, enrich and meaningful; to identify and cultivate the talented person<sup>[2]</sup>. Meanwhile, Seligman pointed that: when a country of a nation was puzzled by starvation and war, the primary mission of social science and psychology is treatment; but when the society is peaceful, it become to make a better live for the people<sup>[3]</sup>. Thus, psychology divided into two aspects: pathology psychology and positive psychology. Positive psychology is a discard to pathology psychology, it is “a science dedicated to research the human’s positive qualities, like development potential and virtue and so on”, it is also the science need to develop in the period of peace.

The concept, Positive national mentality, is an extended based on this context. One of its theoretical foundations is positive psychology. The research of positive national mentality include the theory studying, evaluation and way of guiding, it’s a system which involve in anthropology, cultural studies, sociology and psychology.

### **3 “Growing Pains” and the National Psychological Problems in Current Chinese Social Management**

According to historical experience and social psychology, when a national economic develop into Per Capita GDP 3000 dollars, it will be the golden period of economic swift development, and it’s also the period that all kinds of deep social contradictions highlight. The nation faces with “growing pains”.

Since reform and opening, China’s economy developed successful, but lace of emphasis on national psychology and ideology. It formed “richer in material life, and more urgent in spiritual exploring.” The national mentality tends to bad. The book, Modern Spirit Trap: the Evolution of National State of Mind wrote by Shao Daosheng, analyzed and summarized six morbid social psychologies in China: “addicted to desire for material wealth”, “unreason group restless”, “indifferent humanity”, “vulgarizing”, “irresponsible” and “false exaggerating style”. Due to national psychology problem, now in China the social contradiction are prominent, group incidents, public security, and individual suicides happened more frequently. Those influence the individual healthy growth and development, the complement and happiness of family, the social stability and social basis of the party. The reason that leads to bad national mentality and emotion is complicated and varied. The deep reasons to result the unbalance or morbid of national mentality mainly are income gap, unfair distribution, legal limitations and moral weakening, etc.

## **4 The Value of Positive National Mentality for Social Management**

### **4.1 National mentality is the psychological basic of producing Social management effectiveness**

The deepest lever of social management start from mentality, good individual mentality is an important sign of perfect personality and health of a person, positive national mentality is an important condition and psychological foundation of orderly operation and harmony of a society. Only grasp the social management objects wholly, the manager can define the management goal, strengthen the management defectiveness. Social management effectiveness can be displayed by the achievement of social public policy goal and social management expected effect. National mentality can be displayed by the national’s value orientation, emotion attitude, thinking mode and behavior mode. It can influence the national’s behavior orientation and Decision behavior. Different national mentalities could affect the national and let them to form different recognized and behavior mode about specific problem .It could let the actual social management express different effects. Positive national mentality can lead the people make rational decision, then drive the social management go forward follow expected goal and get expected effect. While negative national mentality will make negative effect to the social management. It may bring the reduction and failure of social management function.

### **4.2 Positive national mentality To prevent and reduce the social risk, promote the social harmony and stability**

National mentality is the weatherglass of social stability. Positive national mentality helps to maintain social stability. After 30 years, the economic of China developed speedily; the economic social structure had been changed deeply, a lot of social contradictions will inevitably appear mostly. Chinese society enters into a high-risk period. If use improperly, it may fall into “the trap of Latin- American”, then influence Chinese social harmony and stability. The prevention and mitigation should be taken to

deal with the crises lead by risk society. “The twelfth five-year plan” made it clear that “cultivate strenuous enterprising, rational peaceful, open inclusive society”. The country attach high importance to social mentality, it’s the important embodiment of people foremost and scientific development, it’s also the important action to prevent and reduce social risks, and promote social harmony and stability.

#### **4.3 Positive national mentality is the aim of social management**

The fundamental task and goal is to coordinate the social relationships, standardize behaviors, conciliate conflicts, promote justice, maintaining stability, etc. To build a positive national mentality is correspond to the aim of social management. Positive national mentality is the important psychological foundation to promote the progresses of individual, society and the nation; it’s the important part of national cultural soft power; it’s also the objective to achieve by social management. If there have positive national mentality, lots of social management problem will be solved.

### **5 From the Perspective of Positive Attitude Horizon Social Management Innovation Path**

#### **5.1 Strengthen advanced thought culture construction, innovate social management concept**

The running of a society can not only rely on system, but also depend on constraint of the mind. To restraint the mind need idea, culture and morality. After all, the reason that bad social mentality and emotion exist is lack of support by scientific belief and value guidance by advanced thoughts and culture. Thought and culture system come from social psychology. It also leads the social psychology and social management. Social management should pay attention to make and advocate the leading values and the inheritance and cultivation of excellent culture. Social management should lead people to use right position, viewpoint and method to observe the society, to use tolerant attitude to see and handle problems, to use culture inspiration and immersion to construct reason spirit and put spiritual home. Then people can “ like their food,clothes, residence and entertainment”.

Now, it must develop the socialist culture more prospective, construct Chinese nation’s common spiritual home and bring socialism core value system into play its function of leading, encouraging and adjusting to strength and to innovate social management. According to the social development and public need, contain the service in management, incarnate the service in management, and realize the management in service. Meanwhile, to pay attention to strengthen the self-discipline of social manager, unify the self-worth and social value to keep up the social consensus and social trust. China’s social management must take order of idea “people foremost”, stick to combine “hard management” and “soft management”, the “moral rule ”and “legal rule”, set the idea “service first and take the service in management ”up and achieve the humanization,socialization, refinement, informatization and systematization of social management.

#### **5.2 To create and perfect the social management institution, to promote the scientific level of social management endlessly**

Now institution construction is key point of strengthening and creating social management. It has overall importance , basic , decisive function about social management. It can achieve scientific level of social management and then provide to maximize public benefit and make good rule of society. China’s institution construction appear sold out and vacuum on condition of quick development of economic and society .Now our social management institution is distemperedness ,lack of standardization and not scientific and it makes many uneven problems. Those problems have become prominent problems in China’s social management .So we should put to create and perfect the social management institution as first things. Now we should stick to combine providing social stability direction and providing social justice in making up new social management .We should construct a effective dynamic regulation and mechanism to resolve all kinds of contradiction and problems ,as while as to pay attention to institution arrangement justice. We need to construct righteous legal system open social system distributed system.

#### **5.3 To strengthen system construction of psychological monitoring and channelize, to create new channels of social management endlessly**

National mentality is the psychological foundation of social management effectiveness. “Know the mind, is goo and save the lost”, only master the trends and evolution of national mentality completely, know the psychological demands and way of acceptance, the government can innovate social supervisor mode with time, enhance the management.

So, there should build a national mentality evaluation index system, strengthen the monitoring, evaluation and warning, improve the national psychology counseling and adjusting, promote the communication way of national emotion expression unimpeded. Now ,Chinese positive mental health



seminar has finished the manufacture of measuring table of positive mental of qualities Students in middle and primary schools, university students and adults(see table 1)。The table use the Likert scale to mark and construct computer measuring system. It has good reliability and validity and is the important tool of measuring, evaluating and researching the positive national mentality<sup>[4]</sup>.Based on this, to innovate the social supervisor mode and way need to encourage public participate, people oriented, to speed up the institutions of the classification reform, guide and stress the enterprise to bear more social responsibility, and develop the social organization and community building. We need to strengthen the informatization construction, be good at use the most advanced idea, the newest technology, the freshest utterance, the popular tact to win the widest support of the nation, finally to get significant results.

**Table 1 The 3 Measuring Tables of Chinese Positive Qualities**

Six dimensions	15 qualities of Students in middle and primary schools	20 qualities of university students	20 qualities of adults
Wisdom(cognition)	Creation; in pursuit of knowledge; thought and insight	Creation; Curiosity; Love study; thought and insight	Creation and Curiosity; Love study; thought and insight
Courage(emotion)	Sincerity; dedication	Sincerity; to persist bravely; passion	Sincerity and fixure; Bravery and passion
Kindheartedness(interpersonal)	Love; Friendly.	Feel the love; Love and kind; wisdom of relationship	Friendly; wisdom of relationship
Justice(citizen essence)	Leadership; cooperation	Leadership; Team work; fair	Leadership; cooperation
Temperance(self-control)	tolerance modest cautious	tolerance modest prudence self-control	Tolerance and modest prudence self-control
to surpass(spirit )	To touch the string humorous Belief and hope	To touch the string humorous Belief and hope	To touch the string humorous spirit belief Optimistic hope

#### **5.4 To strengthen construction of social management team and to improve the relations between the cadres and the masses and public credibility**

Social manager will face public directly in management cross ,so their behavior and working effect will affect public and their bad working style and behavior way will produce and expand the bad national mode and mentality. Those bad national mode and mentality severely affect the relations between the cadres and the masses and public credibility of government, and deeply affect the effective of social management finally. Now some officers' nonfeasance, malconduct and even many illegal action like power-see-rent and power-money deal lead to many bad social general mood and social mentality ,such as enemy officers , enemy rich and universal weak tendency mentality. So if we want to complete the social management job, we must strengthen construction of social management team firstly. The important thing is to do the self-discipline construction and profession training, to raise their political consciousness and working ability ,modify the working style and to provide the social consensus and Social trust . Specially ,we should work the official morality education and continue the anti-corruption uncompromisingly.

#### **5.5 Cultivating and shaping a positive national mentality, making the essential target of social management come true in peaceful period**

“Positive” comes from Latin “positum”, means “practical” and “potential”, it’s an “object” inevitable power which construct on the basic of the understanding of social adjust and human well-being. A society just put “positive” as the fundamental value, this society could be a effect, adjust and humanistic. When the society is in the peace period which is stable and flourishing, the social culture will pay particular attention to the positive of individual and group, such as creative, good moral character and high quality living conditions and so on . China is in the period of peace and renewed, cultivate and shape the positive national mentality conform to “positive”, it also conform to the essential aim of social management in peace. The final aim is lead all the social members to live the happy life.

Nowadays , social manager should lead the nationals to put up good spirit appearance, to construct

positive national quality. So they need to cook true “Chicken Soup for the Soul”. They should create a justice social environment for strenuous mind, a democracy and legal system social environment for reasonable and gentle mind and a harmony without sameness social environment for open and forgivable mind.

## 6 Conclusion

The paper discusses the theory of social management innovation from the angle of positive national mentality in another way. It raises some new ideas like to manage the social from construction of advanced culture, national mentality monitoring, the construction of persuasion system, to create and perfect the social management institution, the construction of social management team and the cultivating and shaping the positive national mentality and so on, and it's not enough. The writer think there should be deeper research and discuss in portray of basic concept and theory, the combination of Chinese traditional culture, the construction of national psychological basic database which is extensive and broadly representative, and the communication and cooperation with other objects. I think we need to unfold deep research and discuss in clearing out the basic theory, clearing up the traditional culture resource, constructing the basic database of national psychological problem and the communication and cooperation with other courses.

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# The Establishing of University's Full-Four-Process Entrepreneurial Education Model\*

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**Abstract:** Establishing entrepreneurial education is a new-born requirement in university, for the development of the society raises the standard for the revolution of the whole education system, besides it is also the international trend throughout the world. This paper, firstly, introduces the thorough circumstances of the development of entrepreneurial education in advanced country as well as in China, and analysis the problems in it. Secondly, the paper summarizes and specifically analysis the main model of entrepreneurial education in Chinese universities, combined with the market surveys and the experiments of entrepreneurial education in Wuhan University of Technology of China, brings out the Full-Four-Process entrepreneurial education model, made up with the wake-up of entrepreneurial conscious, entrepreneurial ability establishment, experiment and training and track service. This model is more full-rounded and systematic than the traditional one, which will be beneficial to the establishment of entrepreneurial talents.

**Key words:** Market survey; Full-Four-Process; Entrepreneurial education model; Curriculum system

## 1 Introduction

In 1947, Harvard Business School started the first curriculum of entrepreneurial Management of New Enterprises which was generally acknowledged the earliest college entrepreneurial education<sup>[1]</sup>. The governments have introduced the supporting policies to provide the financial support for innovational entrepreneurial education and some developed countries have formed a relatively mature enterprise and enterprise support system. At the same time, they held large-scale innovational enterprise competition and project to encourage college student to establish innovational enterprise. Entrepreneurial education has permeated every level of the national education in many countries. In college, they emphasized the innovational enterprise practices of formed a systematic educational model. According to statistics, there have been more than 1600 colleges started 2200 curriculums of entrepreneurship in America and 86% enterpriser in the most outstanding public companies and high-tech enterprises have accepted entrepreneurial education<sup>[2]</sup>. Some developed countries like UK and France and some developing countries like India and Thailand, all of them have started curriculum of entrepreneurial.

In the practice of entrepreneurial education, China started it in the early 90s. The first action of Chinese college students entrepreneurial education was the "Enterprise Plan Competition" held by Tsinghua University in 1998. Though years' of hard work, China has gained a stage achievement in entrepreneurial education both in theoretical and practical. However, it still exist many problems, such as they pay a lot attention on organizing "Enterprise Plan Competition", joining "Enterprise Designing Competition" and setting enterprise centre, imperfect designing of curriculum of entrepreneurship, deficiency of entrepreneurial education teachers and professional institutes and officers etc. This thesis is about establishing the whole new entrepreneurial education model—the Full-Four-Process entrepreneurial education model catering to the problems that exist in Chinese university's entrepreneurial education.

## 2 University's Entrepreneurial Education

Entrepreneurial education is the kind of education process based on the innovative education and creation education, during which the entrepreneurship, entrepreneurial qualities, skills and characteristics are the most emphasized contents for the development of entrepreneurial type versatile talents of students. Through the cultivation of entrepreneurship consciousness, basic knowledge, and first-hand practice, it can allow students equipped with the knowledge, skills and characteristics required for the future vocational activity, in a more entrepreneurial way. And at the same time, it can teach students to have the consciousness and spirit of pioneering work and the mentality of entrepreneurs, for

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the main purpose of this education is not only direct students to start their own businesses but ,more importantly, to foster the positive entrepreneurial attitude and spirit. Entrepreneurial education is the further step of Innovation education, it makes Innovation education more.

In America, entrepreneurial education model divides different curriculums in order to instruct students for differentiated needs on the basis of the recipients' age, philology and knowledge spectrum. What is more, it has been equipped with comprehensive curriculums and stable professional faculty. The entrepreneurial education in Singapore's university adopts diploma education model. While in Australia, entrepreneurial education adopts divided-layer model in curriculum structure. And in China, we mainly have four types, but all four types have one weakness, lack of systematicness as well as relevance, together with uncomplicated curriculum system.

### **3 Entrepreneurial Education Model in Chinese Universities**

#### **3.1 Traditional talents cultivation of entrepreneurial education oriented in the cultivation of the conscious of entrepreneurship**

In China, the general environment of entrepreneurial education in universities is that most of them are following the traditional entrepreneurial education path which oriented in the cultivation of the conscious of the entrepreneurship. Which mainly depends on the wide spread activities, such as enterprise plan competition, entrepreneurial seminar, minor curriculums, or simulation of entrepreneurial, etc to initiate entrepreneurial education, which focus on the light-up of students' entrepreneurial conscious and teach them the basic knowledge.

#### **3.2 Talents cultivation model of entrepreneurial education oriented in the cultivation of the skills of entrepreneurship**

The second model is the new cultivation model of entrepreneurial education which oriented in the development of skills of entrepreneurship, universities which apply this kind of model usually have its own entrepreneurial center or entrepreneurial science-technology park, which cater to the cultivation of the actual entrepreneurial skills of the students, such as Bei Hang University, applies business operation, establishes university entrepreneurial park, allows students to learn how to start their own business through training and experience. At the same time, they also establish institutes which specially support them with fund and consultancy service.

#### **3.3 Capable person cultivation model characterized with the improve of teaching ability**

The third model is the new cultivation model in entrepreneurial education characterized with the improve of the teaching ability. Such as: in Renming University, they give equal attention to the revolution of both the first classroom as well as the second classroom either, and strength the general ability of students. In the first classroom, they enlarge the percentage of the minor curriculums, and add entrepreneurial education series courses, form experimental groups which depend on the major knowledge, and organized by social groups. What is more, in Heilongjiang University, with the core emphasize in the improve of teaching ability, they initiate students' entrepreneurial education, explore "major plus entrepreneurship" combination model and the "major plus industry plus entrepreneurship" embedded new model; establish the entrepreneurial education system—faced with the general environment, based on major, divided cultivation and emphasize experiments. However, this kind of model is more inclined to focus on the theoretical level.

#### **3.4 Capable person cultivation model characterized by area**

The fourth model is characterized by area, which utilize the specific area advantages as well as economy development and resources advantages to initiate the entrepreneurial education. Just like Wenzhou University, who efficiently utilize its area advantages, as Wenzhou is famous for its small businesses and start-up companies, to initiate its students' entrepreneurial education, which is really flagged with its area characteristics, focusing on the development of specialized entrepreneurial workshop to initiate entrepreneurial education. And this kind of model is more deal with the experimental level.

### **4 An Introduction of the Full-Four-Process Entrepreneurial Education Model**

In recent years, the Wuhan University of Technology are on the road to initiate our university students entrepreneurial education, and have made our own contribution to its theory research, and in 2008, successfully applied the innovative person cultivation(entrepreneurial education) experimental zone of education bureau, and clarified our instructive value of entrepreneurial education and the experimental zone of the university: led by science development value, stick to the principle of focusing

on the cultivation of person, respect of individual differences, encourage variety, emphasize in divided instruction, focusing on cultivating the innovative spirit and entrepreneurial conscious of university students, moreover, develop students' entrepreneurial capacity and ability, take the advantage of the industry basis, and establish through entrepreneurial education service system gradually, besides be beneficial to students' full-rounded development, and continually to improve the quality of the cultivation of students. At the same time, within the entrepreneurial service system, there are contents, service type, establishment of operation security system, and the cooperation with all the other aspects in the society.

On the basis of the survey on the entrepreneurial education abroad and at home conducted by Wuhan University of Technology, combined with the instructive idea of entrepreneurial education, we bring out the idea of establishment of thoroughly new Full-Four-Process model of entrepreneurial education in universities, which specifically present in figure 1.

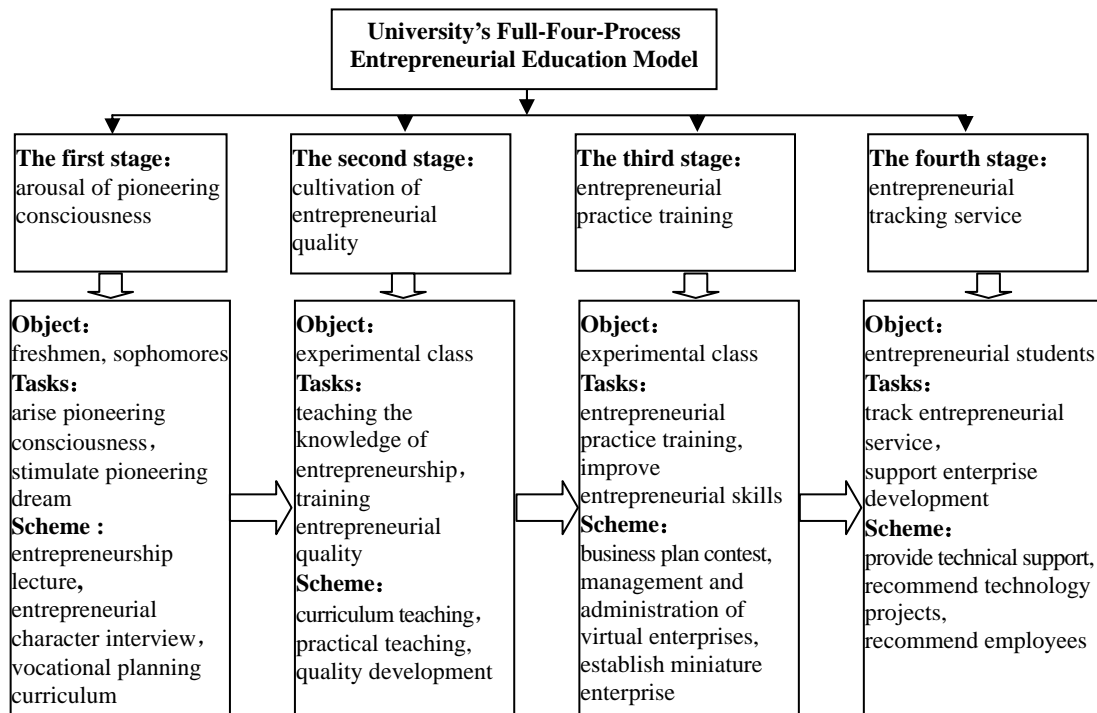


Figure 1 University's Full-Four-Process Entrepreneurial Education Model

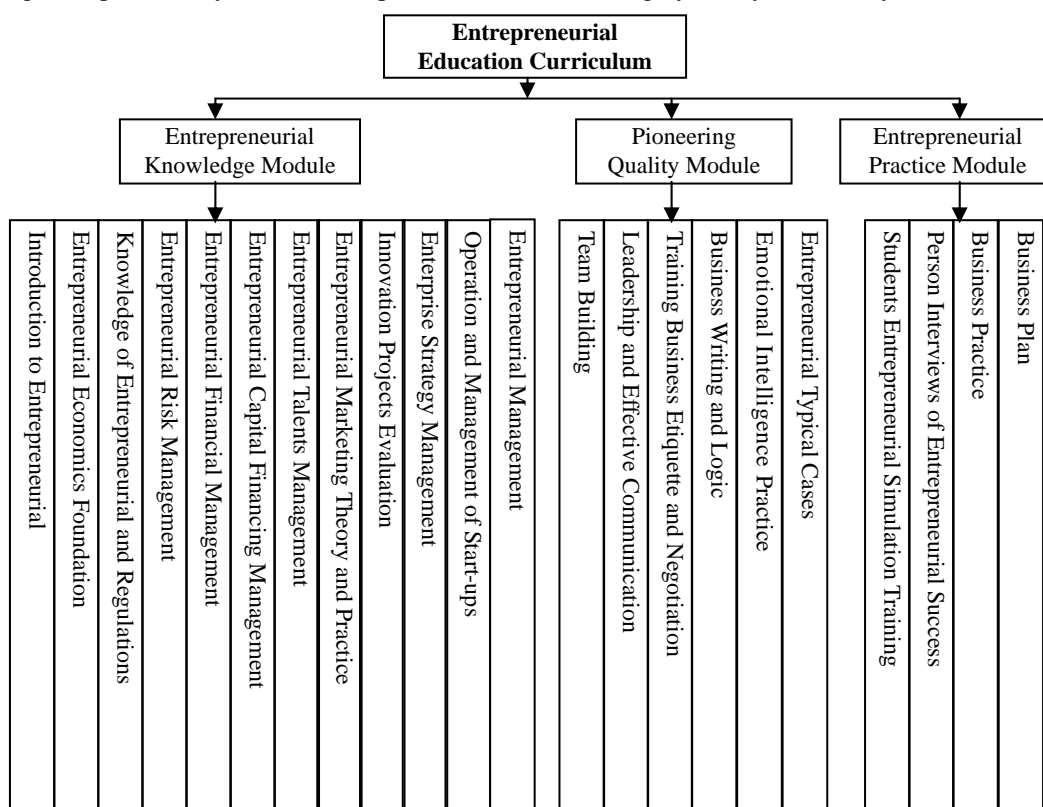
#### 4.1 Process one: the wake up of the conscious of entrepreneurship

This process mainly targets freshman and sophomore, in this process, through courses, seminars, competitions etc, to cultivate a kind of entrepreneurial atmosphere, which aims at lit up students' entrepreneurial passion. Specifically, curriculums can also be related to the education of vocational development, through these vocational courses, students can know themselves, tell the circumstances, and have the right vocational position for them, and at the same time be realized about themselves' advantages and disadvantages. What is more, by opening "university students KAB entrepreneurship basic" courses, we can wake up the conscious of entrepreneurship of students from all aspects. In this process, we also should invite some experts, scholars, entrepreneurs to give some speeches to the students regularly, tell them the importance of entrepreneurial education, by analyzing what kind of person this society needs, what is their harsh employment environment right now, the environment of start their own companies, and introduce the experience of company's management development and their company starting experience, which all aiming at arouse the importance of entrepreneurship conscious within students' hearts. Only by the nutriment of students' ideas, can the students' concepts be changed, and then cultivate the campus entrepreneurial culture. Moreover, through all these activities, like successful elite interviews, start-up company plan competitions, vocational evaluation, etc, to lit up students' entrepreneurial passion, and pick some students who equipped with entrepreneurship conscious and promise to send them to experiment class of entrepreneurial education to receive systematic learning and training. In this process, the recipients are massive and usually relate to low

grade students.

**4.2 Process two: the cultivation process of entrepreneurial quality**

In the operation of entrepreneurial education experimental class, all students should receive entrepreneurial education theories and improvement of entrepreneurial quality which equipped students with the basic entrepreneurial theories, knowledge and good qualities as well as potential to start. All the students will receive full-rounded, systematically and specially targeted courses catering to that we have designed a whole new entrepreneurial education curriculum system, made up with knowledge, quality and practice, specific contents are present in figure 2. After finishes all the required courses, students can own minor management degree, then, I will explain the above three patterns: firstly, knowledge pattern, mainly includes the basic knowledge, such as management science, economics, law; secondly, quality pattern, mainly relates to the cultivation of entrepreneurship related qualities, including interpersonal communication, cooperation management, organization development, business etiquette, etc. thirdly, practice pattern mainly focus on the application of what the students have learnt, containing imitate entrepreneurship process, entrepreneurial practice and training, etc. All three patterns take effects all together, periodically and cultivate potential students thoroughly and systematically.



**Figure 2 Entrepreneurial Education Curriculum System**

Although all these patterns are performed as curriculums, but they are dramatically different from traditional one, while put attention on the knowledge acquirement, it more focus on the improvement of students' comprehensive abilities and qualities, and the most essential thing is the nimble usage of knowledge. And in the teaching process of knowledge, we generally apply case research, group discussion, simulation business, etc. teaching methods, based on the combination of theory and actual facts, views and cases, utility and operation as well as China's environment and specific entrepreneurship programs, drop void theoretical explanation, in the contrast, through analysis and discussion of vivid variety of cases between teachers and students as well as participation play, the new method can help the students to acquire comprehend and apply the entrepreneurship knowledge quickly.

What is more, in the teaching process of entrepreneurial quality pattern, we divide quality into different teaching minor patterns with different contents, and each pattern has its own settled learning hours, which enables students train Periodically until they actually able to apply practice teaching method, lead students to the real entrepreneurial training, or may even make a real start-up business

attempts with students.

Within the quality cultivation process, knowledge pattern and quality pattern account for most part of curriculum system, the teaching of entrepreneurial knowledge and the formation of the entrepreneurial quality are the most important entrepreneurship consciousness, and the quality cultivation process applies to elite education model.

#### **4.3 Process three: practice training process**

Through opening entrepreneurial practice classes, organize series of entrepreneurial practice activities and lead college students to participate in the enterprises' practice based on major advantages. Through entrepreneurial simulation platform to initiate entrepreneurial practice and simulate enterprises' management operation. Through entrepreneurial practices and first-hand experience led by experts' instructions, it will immensely improve students' entrepreneurial ability from all aspects and by all means.

The practice and training process is the implementation process of the whole curriculum system in figure 2, which also targeted the students from entrepreneurial experimental class.

#### **4.4 Process four: followed entrepreneurial service process**

During the process of pioneering work after students' graduation, university will keep on providing support to them with followed service, such as technology, training, management, elite employee recommendation, etc, in order to raise the success ratio of students' pioneering work.

Besides, other services are also include drawing successful student entrepreneurs back to university to help for nurturing the pioneering work of college students cooperation, and the fourth process is an important part for the sustainable development of entrepreneurial education in college and is also a essential part for university to draw investment and cultivate related teachers.

## **5 Conclusions**

Based on wide survey and the pioneering work education exercises of Wuhan University of Technology, this paper brings out the Full-Four-Process pioneering work education new model, compared with the traditional one, this new model is characterized with comprehensiveness and systematicness, and it not only beneficial to the development of students' comprehensive quality and employment competitiveness, however, in reality, cultivate numbers of innovative elite who has actual pioneering capacity.

University's pioneering work education is really essential to our country's innovation project and future economy. But in order to achieve great results, pioneering work education in university should put attention on the following these aspects, apart from the breakthroughs on the model of pioneering work: 1) Put attention on the recruitment and cultivation of the pioneering work education faculty. 2) Cultivate great entrepreneurial atmosphere in campus. 3) Establish entrepreneurial education practice base widely. Universities should emphasize on the entrepreneurial practice activities, for the cultivation of entrepreneurial quality and capability depend on practice.

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## “Five-dimensional Model” of Marketing Management

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**Abstract:** Management is an important factor for the improving of an enterprise. Along with the development of science and technology, the market competition is increasingly fierce, the management mode also need constantly development. The marketing management innovation is a new goal for marketing improvement. According to the experience of Beijing Kedinglong Co., Ltd for many years, the thesis analyzes the basic situation of the marketing management in modern time and proposed a “five-dimensional model” of marketing management, in other words, the five core elements of marketing management: strategies, patterns, implementation, team and performance, which are mutually reinforcing and influencing. Through the description of this mode and its important practical influence, we can get the conclusion that the “five-dimensional model” is a successful mode for marketing management development.

**Key Words:** Management innovation; Marketing management; Five-dimensional model

### 1 Introduction

China's accession to the WTO provides more opportunities to the domestic enterprise. At the same time, we are also faced with more challenges. How to improve the core competitiveness and promote the improvement of the economic benefit in one company and social benefit becomes a problem need to be solved quickly. As an important part of enterprise development, marketing management is important for improving core competitiveness of one enterprise. So the marketing management model innovation is the first job of enterprise improvement.

To develop rapidly, an enterprise should not only depend on its technical capabilities and production capacity, but also depend on its marketing capabilities which are more importantly. Marketing is a kind of science and art which is about the enterprise how to discover, create and deliver value to meet the needs of certain target markets, and meanwhile, obtain the profits. Marketing management is used to identify the unmet needs, define and measure the size and potential profit of the target marketing, and find the most suitable subdivided market for the enterprise and the suitable market supplies for the subdivided market.

In fact, the reason why the world-renowned Panasonic can get a surprising development is that it established its own position in the process of circulation. There is a saying in Japan, “technological Hitachi, and traded Panasonic”. In the early 1950s, after reorganizing the production systems, Mr. Matsushita immediately established a distinctive distribution network and the method of “installment-based payment” so that the Panasonic had a broad prospect. It is the real meaning of marketing management: a kind of ability to control the market and affect the customers to penetrate toward the circulation field, close to the process of consumption and consumer site.

#### 1.1 Marketing environment changes since reformation and opening up

Since reformation and opening up, our social and economic develop rapidly, we contact and trade with other countries more often. In the process of economic globalization, the competition of marketing is more and more fierce. The competition between different companies is turned from domestic competition into international competition. Industry enterprises marketing in our country are faced with more challenges. Computer network has been more and more common, knowledge technology become an important factor of marketing management improvement. There is knowledge technology everywhere. Economic development promotes the improvement of living standard in our country. The consumption management and consumer demand also change greatly. The consumption ability gradually increases, consumers begin to pay more attention to product quality and personalized consumption becomes mainstream consumption. So there are more chances for the marketing development in our country.

#### 1.2 The meaning of marketing management innovation

The marketing management of one enterprise is different with the internal management of one enterprise. The marketing management is under the market environment, which will change at any time. The development and survival of the enterprise need marketing management innovation. Under the fierce market competition environment, marketing management innovation will remind enterprise



managers to manage the company according to the market situation. The marketing management of one enterprise is not same all the time, it needs enterprise managers learn about market changes at any time and put forward different strategies to make all parts solidify and cooperate well. So the marketing management innovation can make different parts cooperate to improve the profit of the enterprise according to the scientific management strategies and make full use of resource. To develop quickly and sustainably, the administrator of the enterprise need to have the marketing management innovation conception and enough professional knowledge to communicate with their employees well and view the development of the enterprise as the most important work which need to be paid much attention to. What's more, the development of the enterprise is directly connected with the sales marketing, that's to say, the enterprise will be faced with great difficulties and get into hot water once the sales marketing situation is awful. Production marketing is closed related to the sales marketing conception and marketing management. So the marketing management innovation will promote effective distribution of the resources and manufacture products which can meet the need of customers to improve the core competitiveness and make the enterprise develop quickly.

### 1.3 The marketing management control

The table 1 shows the basic aspects of marketing management control. We can see clearly that the main job of different departments in marketing management process.

**Table 1 Marketing Management Control**

Control aspects	Principal	Objectives
Annual plan control	The senior management department	Check whether the project goals realized
Profitability control	Marketing executives	Check where to make money
Efficiency control	Function management department or senior management department	Evaluate and improve efficiency of expenditure
Strategies control	Top management or Marketing auditors	Check whether the company is seeking out the best opportunities in the aspects of market, productions or channels

## 2 The Management of Marketing Strategy

Market competition is one of the basic characteristics of the market economy. The right strategies of market competition are the key for the enterprise to achieve its marketing objectives successfully. If the enterprises want to remain invincible in the fierce market, they must establish the concept of competition, make correct market competition strategy, and strive to gain initiative of competition. Besides, strategic management includes the following contents.

### 2.1 Objective analysis

In the company's early development stage, the market has great products and business development potential and space, so the company should spend a lot of resources, time and effort to develop new products or new business, new markets in order to maintain large enough, the necessary growth or growth speed of the company.

In the middle development stage of the company, the market demand growth accelerated competition, which requires the company improve operation efficiency and strengthen the profit model (or business model, mode of operation) based on value chain of the competition. That's to say, the enterprise must make the purification of the embellish and economic value maximize in order to expand the scale of operation and increase operational projects, which will provide auxiliary pad to the sustainable development of the company. Now, the Beijing Kedinglong Co., Ltd is in the middle development stage, so the most important job for the company is to make profit maximized, in other words, the object at this time is to make the production profit more than other similar companies based on the marketing environment in modern time. According to the statistics, the average profit rate of the Kedinglong company is about 10%, which is more than other similar companies. So the profit rate is tallied with the objective in the middle improvement stage.

In the later development stage, the market is saturated and competition is deteriorated, which requires the company to control cost well, maintain market share and make cash capital backflow maximized to make sure the stability of the company's cash turnover rate and reduce the marketing capital requirement and cost. The table 2 shows the objective in the next 30 years. These indicators are

interdependent and there are expansion mechanism and restrictive mechanism in these indicators.

**Table 2 Objective in the Next 30 Years**

Control items	The first decade	The second decade	The third decade
Sales revenue growth rate( $\cong$ )	35%	25%	18%
New sustainable business sales average rate( $\cong$ )	25%		
Personal capital profit growth average rate( $\cong$ )	10%		
Personal cost reduction average rate( $\cong$ )	2%		

## 2.2 Competitor analysis

In the process of conducting marketing activities, it is not enough for the enterprise just realize their customer. The enterprise should also realize its competitors because only by knowing the others and yourself can the enterprise gain a competitive advantage and win in the business battle.

## 2.3 Target market analysis

After find and select the attractive market opportunities, marketing managers should make further market segmentation and choose target market. Segmenting market, choosing target market and market positioning constitute the whole process of target market and are the core content of the target market.

To find the best target market, the managers should establish the Information collection mechanism and market information channel and contact with the well-known IT enterprises to discover new business opportunities. For an example, an USB portable power supply called Energy Link was paid much attention on the SONY Open House Product launch at Las Vegas in 2007. this charger is turned into power supply, which can be carried easily. According to the introduce of SONY company, this production can support most USB of MP3 player, mobile phones and all kinds of other USB devices, and it will be sale about 35 dollars in this summer. If much effective market information like this can be collected and implemented, the company will find target market easily.

## 2.4 Products analysis

The enterprise's marketing activities should meet the needs of the market, and it can only be achieved by providing a kind of product or service to meet the needs of the market. Therefore, product is an important factor in the marketing mix of the enterprise. The strategic management of the product can directly influence and determine the management of other marketing mix factors, which is vital for the success of the enterprise's marketing management, including: product classification, optimization and adjustment of the product mix, product extension and positioning of the product's competitive power.

## 2.5 Marketing method analysis

The product, produced by the enterprise, only can be supplied to the consumers or users at the appropriate time, place and the right price by a certain marketing method, which can overcome the differences and contradictions between producers and consumers, meet the needs of market and achieve the marketing objectives of the enterprise. It is the key of the successful marketing and the important part of marketing strategy to choose what kind of suitable marketing method for the product.

## 2.6 Marketing plan analysis

Making marketing plan is to conceived vision for the company firstly, and then action, until the plan implementation, so as to ensure the stability and rapid growth of the marketing company. The core of the marketing plan is sales income and sales plan. The sales department of Kedinglong company grasp the sales situation in different place, and make different plan according to the special sales situation and evaluation of the sales growth rate to make full use of the resource of the company and obtain the biggest profit.

## 3 The Management of Marketing Pattern

After determining the enterprise's marketing strategy, a very critical issue is to find a suitable marketing pattern which has both core elements and auxiliary elements. The core elements constitute the foundation of marketing pattern, which cannot be changed easily, while the auxiliary elements are serving the core elements, which can be adjusted according to the situation.

From macro perspective, the marketing pattern is mainly divided into three categories: first, the proxy pattern; second, the direct pattern; third, the mixed pattern that includes both the proxy pattern and the direct pattern. The direct pattern can be divided into store direct and network direct because of the development of the Internet.

The management aiming at the marketing pattern is generally a firm maintenance of the established

core elements in a certain period of time, and the flexible adjustment of the auxiliary elements to promote the achievement of marketing objective. For example, if we take the proxy marketing pattern, it is the core elements - “agent, a corporate enterprises which has no investor relations with the product enterprise sells products instead of the product enterprise”, which can not be changed; “the price of the product, the promotion strategy and the payment, and so on” are the auxiliary and can be adjusted according to the market conditions.

The management of marketing pattern is the maintenance to the core elements and the advancing adjustment to the auxiliary elements.

#### **4 The Management of Marketing Implementation**

After having strategic planning of marketing and clear marketing patterns, the next question is the implementation of the marketing planning. It should be tested by the implementation whether a plan is good or bad, and in all of the marketing steps, implementation is the core step. However, the management of marketing implementation is a process of dynamic adjustment, not a static process.

The process of marketing implementation is to make the plan come true via marketing action according to the strategy, plan and programs formulated before so that ensure the stability and rapid growth of the enterprise’s marketing and promote the development of the enterprise. Specifically, the management of marketing implementation should deal well with the following stages:

The first stage is the management of the initial implementation. Initial management is mainly to test the marketing plan’s rationality and feasibility to the program, to find the questions of the program which does not coincide to the actual situation, and to propose amendments to the marketing method and plan.

The second stage is the management of the medium-term implementation. The medium-term management is the key period of the management of marketing implementation. The implementation of a marketing program will be divided into three situations in the medium term: having not completed the plan, normal completion of the plan and exceeded the plan. Among them, both having not completed the plan and exceed the plan have the problem to analysis the reason of the implementation management and adjust the plan and the program.

The third stage is the subsequent management of the implementation. The subsequent management of the implementation is usually the period to complete the marketing plan and to make new plan for the future when the working focus is summarizing the questions and experience of the previous year.

#### **5 The Management of Marketing Team**

All of the enterprise should be completed by people, and marketing is no exception. Therefore, the establishment and management of a marketing team is an important work. The aim of establishing marketing team is to bring high performance to the enterprise. The marketing team is a group of people who are mutual complement by their skills, responsible for each other and working together to improve the enterprise’s marketing profits and achieve the enterprise’s marketing effectiveness. The blue-chip marketing team has a clear understanding to the enterprise’s marketing goal and firmly believes that this goal contains significant meaning and value. Besides, the importance of this goal also motivates the team members to sublimate personal goal to group goal. In a blue-chip marketing team, the members are willing to make a commitment to the team’s goal, and clearly know what kind of job that the team wants them to do, as well as how to work together to finish the marketing task. The establishment of an excellent marketing team should also do the following work:

First, train the marketing personnel. The training to the marketing personnel is to learn the attitude, knowledge, abilities and skills that are closely related with the requirement of marketing work with plan and organization, aimed at making the marketing personnel’s enthusiasm, ability and industry way have some enhancement and improvement which are benefit for the marketing effectiveness. People being trained should not only include the new recruits, but also the experienced marketing personnel and the most successful marketers. Through training, marketing personnel can deeply understand and get along with the enterprise, have a comprehensive understanding to the enterprise’s products, understand the characteristics of customers and competitors, realize the whole marketing process and their responsibilities, adapt to the changing market, overcome the human weakness like loneliness, and cultivate the marketing personnel’s creativity. The training can use the method of giving lessons, studying the case, role simulating, guidance and wing controlling, etc. so that a high performance marketing team can be founded.

Second, make customer relationship management(CRM) towards the customers visited by the marketing personnel.

If an enterprise wants to found a high performance marketing team, it should make effective management to the visited customers, which can ensure the marketing personnel getting better marketing profits from the customers. The management to the visited customers should be done as following words: enhancing the source of the customers' combat effectiveness of mathematical distribution, classifying the customers, standardizing the visited customers, surveying the visited customer's conditions, improving the quality of the visited customers and identify the key person and countermeasures.

## 6 The Management of Marketing Performance

Performance management has been a core work of the HR department, which is a very complex and detailed work. Performance appraisal is reorganization with actual performance to how the staff completes the working objectives and systematic summary to the staff's personal advantages and disadvantages, which provides basis to the decision of the personnel department, like promotion, exchange, rewards, and so on. Besides, performance appraisal is the requirement of giving the staff feedback and confirming the staff's training and career development, and meanwhile, it can help diagnose the organization's problem. In the process of marketing management, performance is still an important step. How can an enterprise do well with the management of the marketing performance?

First, implement well the target responsibility of marketing leaders.

The management of the marketing performance should directly deliver the operational responsibility of the enterprise's survival and development to the marketing leaders, and directly translate the strategic and performance requirement which is relevant with the enterprise's survival into KPI of the marketing leaders. Force the marketing leaders to face the pressure of market competition by relying on the "target responsibility system". Improve continuously the marketing leaders' willingness and ability to take responsibilities by relying on "independent pressure of market competition and the freedom space of their position for innovation. Import the law of marketing competition, determine the "generally acknowledged truth", establish the "rational rules" and relevant mechanism of assessment restraint, compensation incentives and the mechanism of promotion and eliminated, and improve the marketing leaders' willingness and ability to take the responsibility by relying on the "target responsibility system".

Second, do well with the performance evaluation management of the marketing channel.

From a macro point of view, marketing channel performance includes benefit, fairness and efficiency. Benefit is the channel's capabilities to deliver the service needed by the end user's, and meanwhile, it should be as effective and fair as possible when deliver a service. That is to say, in a country, every member has the same opportunity to use and approach to the marketing channel existed in this country. Efficiency refers to the effectiveness of the cost when the social material is used to complete the important products.

Investigating the marketing channel performance from the microscopic point of view, including the view of the manufacturer, the factors that should be examined include the channel's marketing performance, the channel's contribution to the profit, the ability of the middleman, the middleman's obedient degrees, the middleman's ability to adapt, the middleman's contribution to growth, and the customer's satisfaction.

Third, do well with the performance evaluation management of the marketing personnel.

To make effective management of the marketing personnel, the enterprise's marketing managers must establish scientific evaluation and assessment mechanism for the working performance of the marketing personnel, and regard the mechanism as a basis of allotting reward.

At first, the marketing personnel's basic understanding to the assessment work should get a deep understanding from the marketing managers. Therefore, the marketing managers' critical task is how to make the staff realize and accept the function, meaning and process of marketing effectiveness evaluation, fully understand the close relationship between the enterprise and the staff themselves, and make the staff establish an active concept of performance evaluation. What is more, the marketing managers' critical task also contains the preparation of basic data, including the performance data, service attitude data, and capacity evaluation data of the executives and ordinary employees, as well as the preparation for the question before the evaluation of the marketing personnel, including: whether the marketing personnel's quantity and quality can be guaranteed to reach the enterprise's goal, how the

marketing personnel's coordination and communication skills, whether the salary is incentive enough, whether the demission rate is high, and the improvement measures, and so on.

In the aspect of specific personnel performance assessment, the enterprise should establish the assessment process, and then make statistics for personal performance from the statistics of the marketing personnel's sales receivables performance, the marketing personnel's individual sales profit and loss, and the marketing performance according to month and year, and other statistics; at last, make fair and prompt encourage according to the performance.

## 7 Conclusion

Marketing management is one of the most important management of the enterprise. With the expansion of the market, competition is also increasingly fierce, so a good management system will become the important method in market competition. Along with the development of science and technology, management mode also need to be constantly improved, so only with the management innovation of enterprise can improve the market competitiveness of the enterprise. There are many different theoretical discourses about marketing management. The author proposed a "five-dimensional model" of marketing management, which is including of marketing strategy management, marketing pattern management, marketing implementation management, marketing team management and marketing performance management, based on his enterprise practice of many years, hoping it can make contribution to the management of some enterprises, and also expecting to get criticism and comment for correction from more friends.

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## Challenges for Strategic Management of Innovation in a High-Tech Firm: The Case of CPqD

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**Abstract** This paper seeks to identify challenges for strategic management of innovation in high-tech firms, considering the case of a firm from a developing country, embedded in a highly internationalised sector and going through major organisational changes. It provides an assessment of its competitive and technological strategies, how it chooses between acquiring or generating knowledge and how it manages innovation throughout the organisational structure, complemented by a critical analysis of the market it focus. The discussion shows that the firm is under a critical learning process of developing the capabilities needed to be competitive. Its main challenge comes from how it develops new roles and capabilities for managing innovation at the same time it has to integrate those different roles, which are still spread throughout organisational structures and routines. This paper reinforces the view that managing innovation requires a strategic approach by top-management, in which an innovation strategy must be created for defining the way the firm will compete with its portfolio and secure the factors that are needed to create the core competencies and capabilities to develop a sustainable competitive advantage.

**Key words:** Innovation management; ICT; Developing countries

### 1 Introduction

Innovation management interacts with competitive strategy of any given firm and can be considered a key process for growth, despite all the uncertainty and tensions that inherently exist between market-driven incremental innovation and the exploration of market-creating radical change. In a firm, such process comprises (i) the prospection of market and technological opportunities, (ii) the selection of opportunities according to its alignment with business strategies, (iii) the decision-making involving in-house development or sourcing the capabilities needed to explore those opportunities and (iv) the implementation of innovations, from concept to commercialisation of new products or implementation of new processes (Quadros, 2005). But this generic process is influenced by the national and sectorial contexts and the firm's trajectory in terms of learning and innovation, limiting the range of possibilities of the innovation process itself.

This paper seeks to identify the challenges for strategic management of innovation in high-tech firms, considering the case of a former state-owned R&D institute, not only pertaining to a peripheral economy and embedded in a highly internationalised sector, but also going through major organisational changes since its privatisation in the late 1990s. CPqD was the R&D branch of former Brazilian telecommunications holding Telebrás and today is a non-profit private organisation focused in innovations driven by information and communication technologies (ICT), in order to contribute to the Brazilian competitiveness. But CPqD is also competing in a sector dominated by multinational companies and global value chains, at the same it has been promoting organisational changes to move from a public-owned R&D institute to a high-tech market player condition.

The research found that the main challenge faced by CPqD comes from the learning process it has to carry out, in which the development of new roles and capabilities for managing innovation have to be developed in concomitance with the integration of those different roles, all of which are still spread throughout organisational structures and routines.

An assessment of CPqD's competitive and technological strategies, along with a research on how it chooses between acquiring or generating knowledge and how it manages innovation throughout the organisational structure, complemented by a critical analysis of the market the firm has been focusing since its privatisation, showed that CPqD is under a critical learning process of developing the capabilities needed to be competitive.

This paper reinforces the view that managing innovation requires a strategic approach by top-management, in which an innovation strategy must be created for defining the way the firm will compete with its portfolio and secure the factors that are needed to create the core competencies and capabilities to develop a sustainable competitive advantage.

The methodology used in the research includes a bibliographic review on innovation management

literature, in order to collect a set of key issues which were then sought after in the sectorial, national and firm-level contexts under which the subject of analysis operates. Sectorial and national contexts were identified by means of a corresponding bibliographic review, while firm-level context uses information gathered in public reports from CPqD and internal surveys conducted by the author throughout the last 18 months.

In order to identify the challenges faced by this high-tech firm, the paper is divided in the following sections. The next section provides a brief literature review in order to identify key issues to be analysed in the case study. Section 3 details the main transformations that happened in the context under which the research subject is embedded, along with a historical perspective that highlights those same key issues. Section 4 discusses the challenges faced by the research subject and Section 5 concludes the paper.

## 2 Innovation Management as a Key Process for Growth

A first aspect of innovation management is prospecting market and technological opportunities. This has much to do with the relationship between *competitive strategy* and innovation strategy, since the first defines the range of possibilities that should be perceived as opportunities by the latter. Competitive strategies can be divided in two broad approaches in the literature: positioning strategies and resource-based strategies. The first considers competitive strategy as the search for a favourable competitive position in a given industry, in terms of a profitability and sustainability against forces that determine the competition arena (Porter, 1986). The forces determining profitability are: threat of new competition, threat of substitute products or services, bargaining power of customers, bargaining power of suppliers and intensity of competitive rivalry. But it is the sustainable competitive advantage of the firm that determines its relative position in a given industry, leading to three generic strategies: cost, differentiation and focus.

The other approach is the resource-based view of the firm (Penrose, 1959; Prahalad and Hamel, 1997; Barney, 2002; Teece, Pisano and Shuen, 1997; Wernerfelt, 1997) and can be considered highly complementary to the first, since it explores further the sources of competitive advantage. This approach looks at strategy in terms of how to compete successfully, focusing on the “idiosyncratic, costly to copy resources controlled by a firm – resources whose exploitation may give a firm a competitive advantage” (Barney, 2002). These resources could be assets, capabilities, competencies, organisational processes, information, knowledge and so on, the collection of which enables the firm to develop and implement the right strategies to compete effectively.

The second aspect of innovation management is the selection of opportunities according to its alignment with business strategies, which highlights the link between *technological strategy* and competitive strategy. Integrating technology and strategy must first consider the perspectives of the latter. Strategy can be driven by positive or normative views and by product-market or resource-based views (Burgelman, Maidique and Wheelwright, 2001). Positive view reflects top-management beliefs about the basis of the firm’s success in terms of core competencies, product market areas, core values, people and the associations between these elements, while the normative view is concerned with what the firm’s strategy should be. Product-market view of the strategy is concerned with how the firm will compete with its portfolio, while the resource-based view is concerned with how the firm secures the factors that are needed to create the core competencies and capabilities to develop a sustainable competitive advantage. A normative view that encompasses product-market and resource-based views is pretty much in line with the earlier discussion on the relationship between competitive strategy and innovation strategy, since it is driven by what a firm *actually* does and not by what top-management *believes* it does.

The alignment between competitive and technological strategies leads to many of the aspects included in the management of the overall innovation strategy, such as competitive intelligence and technological prospection (Tidd, Bessant and Pavitt, 2001; Miles, Keenan and Kaivo-Oja, 2002; Phall, Farrukh and Probert, 2001; Millet and Honton, 1991; Sandia National Laboratories, 1997), innovation projects portfolio management (Cooper, Edgett and Kleinschmidt, 2001; Cooper and Edgett, 2001; Wheelwright and Clark, 2001; Jolly, 2003), stage-gates and innovation funnel (Ganguly, 1999; Cooper, Edgett and Kleinschmidt, 2002; Clark and Wheelwright, 1993) and knowledge management (Davenport and Prusak, 1998; Garvin, 2000). It also has much to do with the next aspect of innovation management: *the decision-making involving in-house development of or sourcing the capabilities needed to explore those opportunities*. External links between the firms and 3<sup>rd</sup> party organisations should be considered in

the innovation strategy, since it may include alliances for technological cooperation (Tidd, Bessant and Pavitt, 2001; UNCTAD, 2002; Vonortas and Safioleas, 1997; Doz and Hamel, 1997), such as cooperation and co-development with suppliers (Tidd, Bessant and Pavitt, 2001; Bozdogan et al., 1998; Sobrero and Roberts, 2002; Jürgens, 2000).

Finally, the *implementation of innovations*, from concept to commercialisation of new products or implementation of new processes, must encompass all the aspects presented above, in the sense that the introduction of any change – technical or not – must be managed, in order to ensure its acceptance and effective use. Successful innovation management involves taking a strategic approach to innovation and the problems of managing it, developing and using implementation mechanisms and structures – and the supporting organisational context – and building and maintaining external linkages (Tidd, Bessant and Pavitt, 2001).

All the aspects of innovation management presented in this section are influenced by the national and sectorial contexts and the organisation's trajectory in terms of learning and innovation. These two sets of influential factors are the focus of the following section.

### 3 National and Sectorial Contexts and the Organisation's Trajectory

#### 3.1 The telecommunications sectorial context

Until the mid-1980s, innovation processes in the telecommunications sector were vertically - or quasi-vertically - integrated by large monopolistic telecommunications service providers. Telecommunications equipment manufacturers and software suppliers in each industrialised country enjoyed the privileges given by their corresponding monopolistic service providers (and in some countries they were the same company), such as AT&T, France Telecom and NTT, specially due to the old technological and learning regimes in which those suppliers were inserted: the old telecoms industry was marked by closed innovation system, high entry barriers and few innovators (Fransman, 2002a). Moreover, the "engine of innovation" (*ibid*) was located in the research centres of those network operators, such as AT&T's Bell Labs, France Telecom's CNET and NTT's Electrical Engineering Laboratories, in which R&D was conducted to develop new telecommunications equipment and software.

Developing countries, in general, found themselves dependent on foreign suppliers from the triad - USA, Europe and Japan. Nevertheless, in Brazil, technological cooperation activities were being developed by local players, with government policies stimulating indigenous creation of value with growing share of local production *vis-a-vis* equipment imports, along with the development of indigenous technology in cooperation with research institutes, like CPqD and local universities (Szapiro and Cassiolato, 2003). Telebrás was the state-owned monopolistic telecommunications holding and CPqD was at the centre of the system of innovation in the sector, as it was responsible for developing technologies suited to Brazilian characteristics and cheaper than the ones provided by foreign firms. As an example of such role, CPqD developed for Telebrás a new technology for digital telephony switches to compete with multinationals, called Tropicó, a feat that allowed the final cost per terminal to fall from around US\$ 1000 to US\$ 200–300 levels (Loural *et al.*, 2006).

After the mid-1980s, the global scenario changed due to commercial and regulatory liberalisation processes happening in USA, Europe and Japan, which in turn intensified the internationalisation of innovation processes, the end of monopolies and the entrance of new actors in the sector (Fransman 2002a and 2002b; Henten, Falch and Tadayoni, 2004). According to Fransman, the 1990's faced the dawn of a new industry, which he called "Infocommunications", associated to new technological and learning regimes. The old industry was marked not only by closed innovation system, high entry barriers and few innovators, but also by a fragmented knowledge base, medium-powered incentives and slow, sequential incentives. Conversely, the new Infocommunications industry presents: open innovation system; low entry barriers; many innovators; common knowledge base; high-powered incentives; and rapid, concurrent innovation (Fransman, 2002b). Moreover, it was no longer dominated only by the traditional telecommunications equipment manufacturers, but also began to be heavily influenced by companies from the IT sector, such as Cisco Systems and IBM. More recently, firms from Asia have also developed important competitive positions in the global market, with global players such as Samsung, Huawei and ZTE.

This worldwide change had its impacts in the Brazilian telecommunications sector too. The same two processes that happened throughout the world can be considered the major drivers in the institutional evolution and the regulation model of the Brazilian sector in the 1990s: (i) commercial

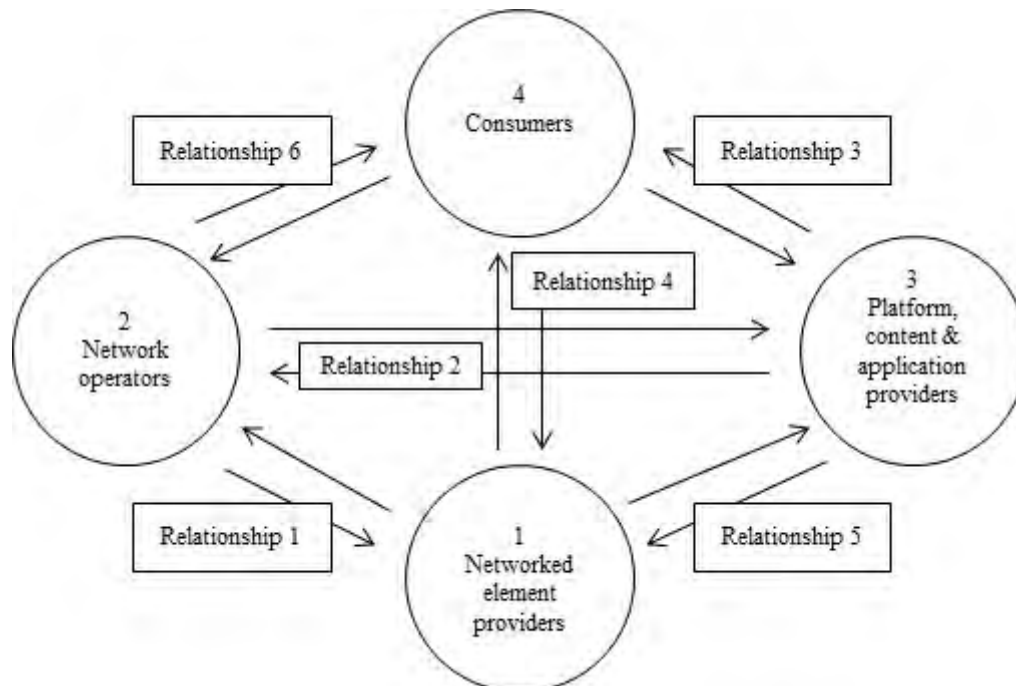


liberalisation and (ii) institutional and regulatory changes. On one hand, liberalisation, along with constant economic crisis in Brazil and an apparent lack of industrial policy, led to a technological downgrade process in the local telecommunications sector, marked by a constant pursuit for cost reductions through organisational changes inside the firms and, consequently, a reduction of local R&D spending (Szapiro and Cassiolato, 2003). On the other hand, institutional and regulatory changes in the late 1990's restructured the national system of innovation, with the privatization of Telebrás and deregulation of the telecommunications sector. This led to an even greater dominance by multinational manufacturers, which imported the great majority of production inputs. Since imports raised, exports were limited to only a few products assembled locally and R&D activities in these firms were located in their home countries, the Brazilian sector as a whole became even more dependent on foreign technology, with only a few indigenous mid-sized technology firms remaining, focused in parts and components with low technological specialization or concentrated in niche markets (Oliva *apud* Szapiro and Cassiolato, 2003). Loural *et al.* (2006) consider that the technological development model was successful as long as the protectionist economic policy persisted, but "when economic and political circumstances could not anymore sustain an import substitution approach, in the 1990-decade, the model fell apart" (*ibid*).

Economical and regulatory liberalisation and competitive pressures have also stimulated the internationalisation of R&D activities in the telecommunications sector, which in turn could open technological opportunities for Brazilian players to become part of global innovation networks, especially in software development (Leal and Loural, 2008). These factors were supported by recent changes at the knowledge base, originated by the technological convergence of telecommunications and IT and the role of global standards, enabling the division of work by means of interoperable modules, thus creating conditions for the development of different organisational models for R&D units in locations throughout the world (*ibid*). Despite those opportunities, recent research shows that, in general, this scenario has not changed. With few exceptions, indigenous firms have not been able to keep up with the pace of the technological frontier created in more advanced economies, remaining distant from key roles in the global networks that define the technological evolution of the ICT industry (Loural *et al.*, 2011).

Another element important in this discussion is the growing concentration of telecommunications service providers market since the privatisation of Telebrás in the late 1990s. What once was a sector with dozens of potential customers to be addressed by any firm in Brazil, is gradually becoming an oligopolistic sector due to mergers and acquisitions among telecommunications service providers. At the present, the Brazilian telecommunications sector is dominated by four economic groups, which correspond to 90% of the total subscribers and 86,5% in terms of revenue (Teleco, 2012) and all four have foreign capital firms in their executive management.

One last and very important element to be brought up derives from the vision of this new ICT industry as a layered ecosystem, which refers to "a number of organisms that interact within an environment" (Fransman, 2007). In the first layer are the network element providers referred throughout this section, which produce computers, software, phones, switches, transmission systems and specialised software systems. The second layer refers to the telecommunications service providers, also referred earlier, which create and operate networks and are the customers of the players in the first layer. The third and fourth layers are related to content and applications providers and the final consumers, respectively. This Schumpeterian approach proposes that the emergence of innovations is largely related to six symbiotic relationships between the players of each of the four layers (Figure 1) with consequences that may or may not be beneficial for the parties concerned (*ibid*). This is relevant for this discussion, because these relationships, some of which did not exist two decades ago, can be seen as sources of opportunities for players in the first layer. These players can diversify in terms of creating new products and services to be marketed to players in the third layer and/or they can explore themselves new products and services and be part of that third layer. Of course, this brings up many new challenges since players in layer 1 have to evolve from the old telecommunications model, in which they were only driven by the traditional telecommunications symbiotic relationship 1.



**Figure 1 Symbiotic Relationships Between the Four Groups Of Players in the New ICT Ecosystem (Fransman, 2007)**

In sum, the telecommunications sector, now part of a greater ICT ecosystem, has changed from a condition of a closed innovation system, with high entry barriers, few innovators, fragmented knowledge base and slow, sequential incentives, to one of an open innovation system, with low entry barriers, many innovators, common knowledge base and rapid, concurrent innovation. In Brazil, commercial liberalisation and institutional and regulatory changes created a context in which indigenous networked element providers had to face an even stronger competition from foreign firms, not only due to telecommunications equipment manufacturers and companies coming from the convergence with IT, but also due to a trend in market concentration in terms of potential customers. Nevertheless, with rapid innovation cycles and growing internationalisation of innovation networks, along with the evolution of the ICT ecosystem creating new roles and relationships, indigenous firms have to deal with new opportunities and challenges. In terms of Porter's competitive forces, local firms developing a competitive strategy are facing strong threat of new competition, bargaining power of customers and high intensity of competitive rivalry.

### 3.2 Historical overview

In 1972, the Brazilian government created Telebrás, the monopolistic telecommunications holding, and in 1976 created CPqD, its R&D branch located in a region close to some of the country's largest universities and industrial base. The industrial policy at that time was based in the "import substitution" principle, in which technologies and products were developed in order to strengthen the country's commercial balance. The dual purpose of CPqD's creation was (i) to conduct activities that would lead to telecommunications products and (ii) to absorb technologies in order to avoid or substitute imports. This model, which derived from the industrial policy explained in the previous section, was in place until the late 1980's and throughout that time period CPqD, with the support of universities, led technological development and transferred technologies to 3<sup>rd</sup> party manufacturing firms. Aligned with that, Telebrás would then orient its telecommunications service provider subsidiaries to purchase the corresponding products from those manufacturing firms. In the early 1990s, this model was broken by the change in the overall federal industrial policy, henceforth becoming driven by competitive integration to the international markets, gradually exposing local industries to international competition. Since then, CPqD, and the local firms that explored the technologies developed by it, had to compete face to face with global players such as Siemens, Alcatel and Ericsson: Telebrás's subsidiaries no longer were forced to purchase products based on technologies developed by CPqD.

By then, CPqD had already developed in-house capabilities and external linkages around many relevant ICT technological areas that could be considered in pace with the state-of-the-art. This was used

by top-management as the rationale in changing the firm's product development portfolio to one that would be in condition to compete with the international players in Brazil. At that time, telecommunications network operations support systems, as well as business support systems, were starting to become the focus of telecommunications service providers. Thus, CPqD opted to lessen the importance of network gear development in its portfolio and strengthened its software development program driven by that market demand. CPqD also began to offer a specialised technological services portfolio to local telecommunications service providers, driven by its ICT expertise learned throughout its history.

Another big change in CPqD's trajectory occurred in 1998, when the Brazilian government privatised its telecommunications firms. Telebrás was divided in 13 parts, being CPqD one of these. On one hand, CPqD became an autonomous private firm, no longer tied to the typical "bureaucracies" of state-owned organisations, but on the other hand it had to start facing the challenge of any given private firm: being self-sustainable. In other words, using the ICT ecosystem model, CPqD changed its position in the layered model, moving from layer 2 - network operator - to layer 1, becoming a supplier of software and services to layer 2 (symbiotic relationship 1) and product technologies to network element suppliers (intra-layer relationship).

Driven by the challenge of being a self-sustainable and autonomous private firm, CPqD's top-management decided to diversify its activities and began exploring other markets besides telecommunications using the capabilities it had in ICT, something not possible before when it was a state-owned firm. Today, CPqD conducts technical and commercial activities not only in telecommunications, but also in the following markets: energy, financial services, government & public sector, corporate and manufacturing companies. CPqD also diversified in terms of the geographic location of marketing & sales activities, creating firms overseas to explore markets outside Brazil. It also began creating high-tech firms to explore the technologies developed by means of its in-house technological activities.

### 3.3 Competitive strategy

CPqD uses a *positioning strategy* based on three pillars: technological intelligence for the market, leadership in ICT development and partnership with the Brazilian state. The first pillar is based on (i) state-of-the-art works conducted with exemption and independence, (ii) technological development driven by market needs and trends and (iii) the creation of a multiplying effect in the ICT value chain. The second is based on (i) transferring technologies to manufacturing firms, on (ii) supplying software systems and on the (iii) creation of high-tech firms. Finally, the third pillar is based on becoming a partner of the state, developing advanced technologies under public R&D programs that contribute to digital inclusion.

This positioning strategy seeks sustainable competitive advantage by means of a *focused differentiation strategy*. CPqD's original strategy after its privatization in the late 1990s relied on differentiation in terms of technological competencies inherited from decades of experience developing technologies for the telecommunications sector and in terms of professional links with both the academia and key decision makers in recently privatized telecommunications service providers. Initially focused only in telecommunications, CPqD broadened the efforts of its original strategy including the other five segments listed earlier as potential markets to conduct business, but it can still be considered a focused differentiation strategy, since all activities rely on the firm's ICT market-related capabilities.

### 3.4 Technological strategy

The alignment between technological strategy and competitive strategy can be seen through the selection of opportunities stated on CPqD's chosen *activities* and *outputs*.

On the first place, CPqD conducts *activities* divided in three groups: "R&D program", "sales force" and the "creation of firms".

Its "R&D program" is divided in terms of the source of funds used to run its projects. A first one is based on resources coming from the telecommunications sectorial fund – FUNTTEL – which funds the firm's largest R&D projects and complies with the Telecommunications General Law, in terms of maintaining CPqD's competencies in telecommunications even after privatisation, focusing public interest innovations and technological transitions. These projects, which must be related only to the telecommunications sector, are approved by a specific council including representatives from many public and private organisations. This is strongly related to the third pillar of CPqD's positioning strategy: to become a partner of the Brazilian state. The second one comes from R&D funds managed by many government organisms, such as São Paulo Research Foundation (FAPESP) and Financiadora de Estudos e Projetos (FINEP). CPqD applies proactively or reactively to projects related to research

programs sponsored by those organisms. The third one originates from customer-led development projects, under which CPqD's customers have access to the technologies and other assets developed. Most of them are driven by the electric energy companies and by IT manufacturing companies, all of which are obliged to invest in R&D projects under corresponding federal regulations. The fourth and last one corresponds to in-house projects funded by CPqD's financial resources. Since the firm is a non-profit organization, it may reinvest its surplus to create its own R&D projects.

The second and third groups of activities – “sales force” and “creation of firms” – have the main goal to explore commercially its products and technologies in the market. The former is driven by its own marketing and sales staff and focuses the telecommunications, energy, financial services, government & public sector, corporate and manufacturing companies vertical markets. The latter implies the creation of new firms, which become responsible for all the operations needed to explore the technologies developed under CPqD's “R&D program”. Its purpose is to leverage the generation of innovations from R&D investment and at the present time, CPqD has created over ten high-tech firms, located in Brazil, USA and Angola.

On the second place, CPqD has *outputs* which can be divided in three large groups: software systems, technological services and product technologies. Software systems and technological services composes CPqD's portfolio used by its “sales force”. Software systems are mainly operations support systems and business support systems. Technological services are highly specialized consultancies, customer-led developments and laboratorial services, many of which are provided only by CPqD in Brazil, and are based on CPqD's expertise in ICT and laboratorial infrastructure, developed and created throughout its R&D-related historical trajectory. The third group is related to technologies that result in serial products and since CPqD is not devoted to serial production, they are transferred to 3<sup>rd</sup> party manufacturing companies, which in turn become responsible for commercial exploration under licencing contracts or similar agreements. CPqD's *outputs* can be pictured in terms of year-over-year growth in the market reached by the firm's technologies in the last decade and, despite the fact that every year shows positive growth, there is a tendency that this growth is decelerating (Figure 2).

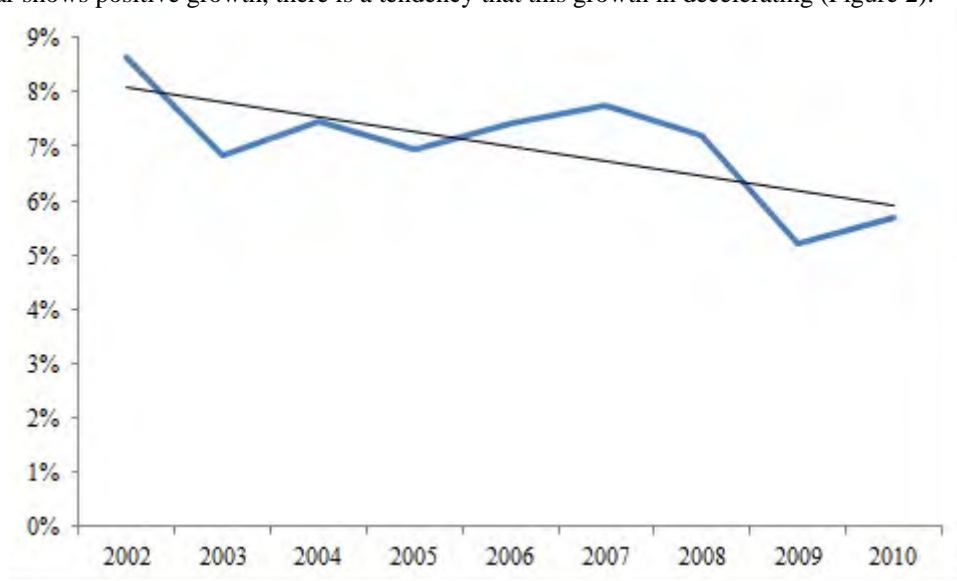


Figure 2 YoY Growth in the Market Reached by Cpqd'S Technologies

### 3.5 Decision-making involving in-house development of or sourcing capabilities

CPqD has two approaches to the involvement of 3<sup>rd</sup> party organisations in its technological strategy. The first is driven by the directives set by top-management for its “R&D program”-related activities, under which CPqD has to foster a partnership environment to integrate specific competences from every agent involved in the program: government, universities, research institutes, costumers and the overall private segment. The decision-making process is left to the mid-management staff responsible for each R&D project and is driven by its own idiosyncrasies.

The second approach is also driven by top-management directives, but in this case they are related to the “sales force”-related activities. In this case, CPqD has to promote strategic partnerships to fulfil customer needs aligned with those market segments defined in the firm's positioning strategy. Thus, the

decision-making process is driven by the marketing & sales mid-management staff of each vertical market and is not only focused in building strategic partnerships, but also in creating new sales channels by means of a network of sales representatives. Strategic partnerships are divided in “technological partners” and “application partners”. The first are based on using basic technological assets from 3<sup>rd</sup> party companies, which are embedded into CPqD’s proprietary products. The second refers to the conjoint development and marketing of new solutions that use technological and marketing assets from both firms.

### 3.6 The implementation of innovations

CPqD has two approaches to innovation management. One is related to control, which is performed by a specific corporate department that answers directly to the organisation’s top-management. This department uses inputs from the firm’s strategic plan, from its own market and technological forecasting activities and from R&D projects proposals coming from all technical areas. Using these inputs, this department provide corporate directives, R&D budget allocation and R&D project control. It is also responsible for measuring R&D outputs in terms of the number of patents, publications and new products.

The other approach is in each of CPqD’s technical departments, which have their own mid-management staff providing and receiving inputs to and from the corporate innovation management department. These innovation managers are responsible for technological monitoring activities and for proposing R&D projects, which should focus new offerings aligned to market needs.

Technical departments also have corresponding “product marketing management” staffs, which is a very recent effort, with only a few years. Even more recent - less than a year - was the definition of the scope of work for this role by the HR department, along with the dissemination of “best practices” by means of an unofficial training driven by CPqD’s “sales force” (meaning it was not driven by the HR department). In theory, this technical area inside each technical department should develop marketing plans in line with product life-cycle management, but a survey conducted throughout all technical areas have identified a few points of attention.

One first point of attention is that, in practice, product life-cycle management routines are not fully institutionalised in CPqD. Product marketing and management staff are mainly driven by daily pre-sales activities, more specifically bids & proposals, with poor congruence with what those roles demand. Such roles should be based on specific routines for “product management” and “product marketing management”, all under a broader framework for product life-cycle management. The first refers to market analysis, business cases and profit and loss investigation, customer and market research, writing marketing requirements documents and working with engineering to finalize functional specifications, competitive analysis for use internally at the company, analysis of technology trends, running alpha/beta programs and capturing early customer feedback, making feature, schedule and cost trade-offs as the product nears completion (Lawley, 2003). The second includes writing product launch plans and product messaging, developing sales tools (white papers, presentations, collateral, competitive analysis for external use with customers), working with PR to manage launch tours and product review programs, setting product pricing, working with beta sites to generate customer success stories, running product launches and working with sales, channel marketing, corporate marketing, marketing communications, technical support, finance, operations and other departments to ensure the product is effectively introduced to the market and continues to be successful (*ibid*). Being driven by the short timeframe and the rush of bids & proposals activities, product life-cycle management is consequently not considered a priority by technical departments. This creates weaknesses in the product marketing outputs developed by technical areas, which should then be used by the remaining “sales force” personnel. Consequently, the latter become more dependent on the technical area staff for conducting pre-sales and sales activities, thus creating a vicious cycle in which the priority of product life-cycle management remains at the bottom. It also creates weaknesses in the product itself, due to the absence of institutionalised product planning and control routines in the technical areas. The evolution of existing products becomes driven mainly by opportunistic market opportunities and not by careful market research and analysis, business cases and profit and loss investigation and so on.

The second point of attention is a rather strong incongruous match between the two groups of routines described above and the capabilities found on the personnel working in the technical areas. The survey identified that the people responsible for “product marketing” lack the set of skills needed for that, considering themselves much more congruent with “product management”, but even this is almost non-existent. As Lawley (2003) pointed out, product managers work close to engineers, while product marketing managers deal with product messaging, sales force training and working with press, each

demanding very different skills. Moreover, although project management capabilities are well developed throughout CPqD's technical departments, many of which have managers certified by international institutes, they are, in general, used solely for R&D project management and not for product life-cycle management.

Finally, there is also a gap in measuring innovation outputs in terms of the level of success of new products in the market, such as sales from new products or selling to new customers, due to the lack of systematic and accurate statistics. On one hand, information systems used to automate sales force activities and enterprise resource planning are not in match with CPqD's portfolio of products and services. Thus, portfolio management is fundamentally at risk, since there is no accurate data showing which elements of the portfolio are more profitable or generate more revenue or are more innovative. In short, it is difficult to verify how close or distant the portfolio is to the firm's overall strategy. On the other hand, there is no definition of what to measure whatsoever. The mere definition of what constitutes an innovation is a difficult task. It could consider "attributes and performance characteristics of the product as a whole" and "changes in components of the product which improve its efficiency, including the nature of the services which it delivers" (OECD, 2012).

#### 4 Discussion

From the elements provided in previous sections, it is possible to picture a brief summary of CPqD's competitive strategy. The firm relies in its two sources of competitive advantage - technological competencies in developing ICT for decades and professional links with academia and key decision makers in recently privatized telecommunications service providers - in order to apply a focused differentiation strategy in the following industries: telecommunications, energy, financial services, government & public sector, corporate and manufacturing companies.

The telecommunications sector is at CPqD's origins and was the basis for the development of its competitive advantage. Nevertheless, as shown earlier, this sector has undertaken a plethora of structural changes, both in the global and local perspectives. Since the privatisation of Telebrás and the birth of CPqD as an autonomous market player in the late 1990s, the sector became marked by an open innovation system, with rapid innovation cycles and new players constantly being born and competing locally and globally for markets becoming more concentrated as network operator merge with one another.

Looking at the telecommunications sector as a market for CPqD's outputs, its source of competitive advantage to keep the differentiation strategy is under threat. The most obvious threat is the fact that professional links with key decision makers in network operators are finite. As time goes by, key personnel in network operators that were there after their privatisation are being replaced and new links have to be constantly created in symbiotic relationship 1, a process that suffers from fierce competition by global and local players and by the bargaining power of an oligopolistic market. At the same time, network operators, in their turn, have to create, manage and foster the new symbiotic relationships in the new ICT ecosystem. Afraid of losing control of their customers in symbiotic relationship 6, network operators are either strengthening their symbiotic relationship 2 with content and applications providers in order to be closer to market signals from consumers they share or are themselves diversifying into layer 3 and creating their own symbiotic relationship 3 with their consumers. The point here is that all these symbiotic relationships are multidimensional: purchase-sale (financial flow), input-output (material flow), information flow and input flow into the innovation process (Fransman, 2007). The behaviours associated to the last two dimensions in the symbiotic relationship between CPqD and network operators pose the biggest threat to maintaining CPqD's source of competitive advantage. The fourth dimension collects elements from the other three in order to innovate (*ibid*). For example, CPqD (in layer 1), which is involved in a symbiotic relationship 1 with network operators (in layer 2), uses its revenues (purchase-sales), along with inputs from partners (input-output) and the information it has gathered (information flow) in order to generate innovations, such as new software applications for telecommunications network operation. Continuing with the example, in the new ICT ecosystem, network operators (in layer 2), facing competition from other network operators, are compelled to provide new value added services to consumers (in layer 4), such as location-based software applications, which can be done either in partnership with content and applications providers (in layer 3) or by becoming content and applications providers themselves (moving into layer 3). All this involves purchase-sale and input-output dimensions, and also, more importantly, information flows and input flows into the network operator's innovation process, which in turn, may or may not be fully transferred

to players in layer 1, such as CPqD. This poses threats to CPqD's source of sustainable advantage, since not only new professional links have to be constantly created, but new technological competencies in developing ICT must be also constantly monitored and created in order to be in sync with the network operator's innovation process. In short, all the new symbiotic relationships sought by network operators are impacting the information flow and input flow into the innovation process. CPqD success in the telecommunications market will be determined, in part, by its ability to create the competences needed to monitor and respond to market and technological signals provided by the whole ICT ecosystem.

Moving to the other vertical markets (energy, financial services, government & public sector, corporate and manufacturing companies), the challenges are potentially even greater. One of the sources of CPqD's sustainable advantage - professional links with decision-makers in network operators - is irrelevant in those markets. Moreover, the professional links with the academia developed in its past history as the R&D branch of Telebrás are not necessarily the same ones that are needed to generate technological innovations for those markets. Thus, CPqD relies heavily on its technological competence in ICT as the main source of sustainable competitive advantage. The electric energy and manufacturing companies are probably the ones in which CPqD developed a relatively strong competence in R&D, mostly driven by customer-led development projects under its "R&D program"-related activities. The same cannot be told in terms of building a portfolio of products and services to be explored by its "sales force"-related activities. In the other vertical markets, CPqD still has a small portfolio too and its technological competences are still restricted to specific niche opportunities, such as fraud management (financial) and public management (government) software systems. Looking again at the ICT ecosystem layered model, the challenge for CPqD is to develop or strengthen (i) symbiotic relationship 4 with layer 4 (consumers), (ii) relationship 5 with layer 3 (content and applications providers) and (iii) possibly relationship 5, by becoming a player in layer 3. This is a great challenge, considering the dimensions of information flow and input flow into the innovation process, along with the fact that it has been only 14 years since CPqD's privatisation and diversification into other markets besides telecommunications.

All the challenges identified here can be tackled using a strategic approach to innovation and the problems of managing it, developing and using implementation mechanisms and structures and building and maintaining external linkages (Tidd, Bessant and Pavitt, 2001). This is in line with linking technological strategy, competitive strategy and the overall innovation strategy under a normative view that encompasses product-market and resource-based views. The main question in this approach is related to what the firm's strategy should be in order to define how the firm will compete with its portfolio and secure the factors that are needed to create the core competencies and capabilities to develop a sustainable competitive advantage.

Success in innovation depends not only on technical resources, but on the capabilities in the organisation to manage them (*ibid*). Under this approach, successful innovation management depends on the learning process that each specific firm has to go through in order to build, improve, recognise, understand and facilitate the emergence of effective routines, which need to be integrated into a set of abilities that together make up the organisation's capabilities to manage innovation (Table 1).

**Table 1 Core Abilities in Managing Innovation (Tidd, Bessant and Pavitt, 2001)**

Basic ability	Contributing routines
Recognising	Searching the environment for technical and economic clues to trigger the process of change.
Aligning	Ensuring a good fit between the overall business strategy and the proposed change.
Acquiring	Recognising the limitations of the company's own technology base and being able to connect to external sources of knowledge, information, equipment etc. Transferring technology from various outside sources and connecting it to the relevant internal points in the organisation.
Generating	Having the ability to create some aspects of technology in-house.
Choosing	Exploring and selecting the most suitable response to environmental triggers which fit the strategy and the internal resource base / external technology network.

Executing	Managing development projects for new products or processes from initial idea through to final launch. Monitoring and controlling such projects.
Implementing	Managing the introduction of change – technical and otherwise – in the organisation to ensure acceptance and effective use of innovation.
Learning	Having the ability to evaluate and reflect upon the innovation process and identify lesson for improvement in the management routines.
Developing the organisation	Embedding effective routines in place – in structures, processes, underlying behaviours etc.

CPqD is under a learning process of developing the capabilities needed to be competitive in a very turbulent sectorial environment. The many roles relevant for managing innovation are spread on different organisational structures and routines. So the main challenge is to integrate these different roles and keep developing the capabilities in the organisation.

On the first place, routines for *recognising* technical and economic signals to initiate a process of change and *aligning* them to the overall business strategy are still poorly institutionalised and are hardly integrated with one another.

On the second place, CPqD needs to integrate the two different approaches used in the decision-making involving *acquiring* or *generating* assets needed in the innovation process, developing effective routines for such, which in turn should be used to *explore and select* the most appropriate response to the technical and economic signals. “R&D program”-driven and “sales force”-driven routines for decision making on the subject are already in place and each have many corresponding success cases, but they should be approached using integrated and effective routines. Strategic partnerships are a plausible option for reducing risk and uncertainty and accessing complementary assets (UNCTAD, 2002), especially on a sector marked by an open innovation regime such as ICT, but they also depend on building effective routines for dealing with transaction costs associated to those partnerships. These routines also have to consider the difference in power between partners, such as CPqD and multinational firms, but there is a good chance to build a successful collaboration agreement between asymmetric partners (Blomqvist and Hylaheiko, 2000).

On the third place, routines for effective *execution* of R&D projects are in place in CPqD, but the firm should develop additional capabilities in order to apply them to product management, in terms of managing development projects, from initial idea through final launch, and monitoring and controlling such projects.

On the fourth place, there are gaps in measuring innovation outputs. CPqD can fill those gaps by defining innovation outputs and embedding them into information systems aligned to the portfolio of products and services used by “sales force”-related activities and to the product development projects carried out by the “R&D program”-related activities.

On the fifth place, CPqD is still institutionalising product life-cycle management routines. The main challenges here are (i) maintain product marketing and management staff at a “safe” distance from daily pre-sales activities and (ii) develop the right skills in product marketing and management staff. Perhaps this issue can be considered the greatest organisational innovation the firm in developing in its recent history, since it means the creation of a market-oriented organisation at the same time it has to foster its technology-driven competencies developed throughout its R&D institute heritage.

## 5 Conclusion

The purpose of this research paper was to identify a set of challenges that a developing country high-tech firm has to face in order to develop capabilities needed for strategic management of innovation under the influence of sectorial turbulence and constrained by its own firm-level learning regime. CPqD was a state-owned Brazilian telecommunications R&D institute privatised in the late 1990s and since then has been facing the challenge of being self-sustainable by means of exploring and leveraging its ICT capabilities, at the same time it competes with multinational companies and tries to position itself in global value chains.

On one perspective, the telecommunications sector has suffered many structural changes, becoming part of a greater ICT ecosystem, with low entry barriers, many innovators, common knowledge base and



rapid, concurrent innovation. In Brazil, indigenous firms had to face growing competition from foreign firms in a market highly concentrated in terms of potential customers. Nevertheless, the evolution of the ICT ecosystem offers new technological opportunities and challenges for those indigenous firms.

On another perspective, CPqD's trajectory began in 1970s as a state-owned R&D institute with the purpose of fostering the "import substitution" industrial policy at the time. By the 1990s it had placed itself in the centre of the national system of innovation, but commercial liberalisation and institutional and regulatory changes conducted by the federal government, driven by competitive integration to the international markets, gradually exposed local industries to international competition. This led to changes in CPqD's product development portfolio, giving more attention to specialised software systems for telecommunications network operators and specialised technological services. In 1998, CPqD was privatised and, since then, diversified its activities and began exploring other markets besides telecommunications using the capabilities it had in ICT, created overseas operations and new high-tech firms to explore the technologies developed by means of its in-house technological activities.

An assessment of CPqD's competitive and technological strategies, along with a research on how it chooses between acquiring or generating knowledge and how it manages innovation throughout the organisational structure, complemented by a critical analysis of the market the firm has been focusing since its privatisation, showed that CPqD is under a critical learning process of developing the capabilities needed to be competitive. The main challenge faced by the organisation is how to integrate different roles relevant for managing innovation, which are still spread throughout organisational structures and routines, at the same time it has to keep developing them in the organisation. The author also provides a set of recommendations on how to tackle those main issues identified in the research.

One can conclude that a strategic approach to the management of innovation fits well in this case study, since most of the opportunities for improvement identified in the discussion have to do with the problems of managing, developing and using implementation mechanisms and structures, specially supporting organisational context, and building and maintaining external linkages. This is very much in line with what Tidd, Bessant and Pavitt (2001) and Burgelman, Maidique and Wheelwright (2001) have explored. In short, the main question for top-management is what should be the firm's strategy for defining the way it will compete with its portfolio and securing the factors that are needed to create the core competencies and capabilities to develop a sustainable competitive advantage.

Further research can be conducted to use this approach in other high-tech firms in developing countries and competing in highly internationalised sectors. This could be used to identify possible similarities in the challenges faced by these firms in terms of learning processes they have to manage in order to build, improve, recognise, understand and facilitate the emergence of effective routines. Policy-makers could then use these conclusions to develop frameworks for facilitating the creation of organisation's capabilities to manage innovation.

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# Analysis and Effectiveness of a Real Organization's Strategic Human Resource Management

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**Abstract:** This paper focuses on analysis a real organisation's strategic human resource management. VACRO organisation was established in 1872. The strategic human resource management issues raised in this case is human resource outsourcing. Human resource outsourcing is one of the most significant forces affect human resource management via gaining more competitive advantages. In order to develop organization performance, strategic human resource management must be evaluated in terms of how they contribute to the achievement of the organization's strategic business objective, such as: being measurable, including deadline dates for accomplishment, identifying and involving the hr customers to ensure the necessary collaboration, nominating the individuals or parties responsible for implementation.

**Key words:** Human resource management; Competitive advantages; Collaboration; Implementation

## 1 Introduction

This paper has show the human resource management study of VACRO organisation, which was established in 1872 after the 1871 royal commission into the penal establishments and goals, as the discharged prisoners' aid society of Victoria. This report also illustrates the strategic human resource issue that is human resource outsourcing. After analysis how strategic human resource links to company mission the how the competitive advantage of human resource outsourcing can be achieved, there are also some recommendations that how an effective strategy contribute to the achievement of the organization's strategic business objective.

As the discharged prisoners' aid society of Victoria, VACRO was established in 1872 after the 1871 royal commission into the penal establishments and goals. It was urged by the royal commission to give assistance to discharged prisoners. VACRO is a non-government, non-denominational organization [1].

In 1872, the early work of the discharged prisoners' aid society (PAS) focus on providing material aid to prisoners. For example, they prepared almost 700 large paper bags with a pound of wonderful foods and some tobacco to prisoners at Christmas. Meanwhile, they also offer toys, health food and gifts to families via generous donations from the community. At the following year, a ladies branch committee was establishment in order to respond the needs of female. As part of the Victorian department of justice better pathways strategy, the service of women including transitional support, mentoring and assistance with childcare and transport for women completing community based orders. In 1913, PAS considered that it was necessary to work with 'prisoners' wives and support family members' needs with early insight to maintain their relationship. Their early intervention and prevention work with families and children reduce the damage done by crime to future generation. Nowadays, VACRO has reflected many changes during its history. A typical assistance might involve pick up someone on their release from prison, a help of homelessness and management of prisoner banking via electronic funds transfer. VACRO now using a through care approach to help prisoners such as working with them, their families and communities at the time of arrest, through court, in the prison system and the period when they transition safely back into community life <sup>[1]</sup>.

## 2 SHRM issues: Human Resource Outsourcing

According to the information received from Varco's external HR consultant Mr. O'Grady who only works at VACRO one day per week, VACRO is a very small organization that only employs around 100 people. There are no internal HR staffs in its organization structure. Other staff without HR background has undertaken the HR work. He said:" I am doing some work for VACRO at the moment one day per week and once HR policies and procedures are in place, I expect the CEO will best decide how HRM activities will be managed within existing staff resources. HRM matters are the overall responsibility of the CEO who sits on the Board".

Every company and its CEO are under the unremitting pressures to improve performance. Based on Varco's HR consultant Mr. O'Grady' understand, VACRO is a very small organization, it might be not

necessarily to have a special human resource department. The HR work has undertaken by other staff without HR background. In order to improve their performance, VACRO needs an experienced “outsourcer” design and support HR activities. The manager will happy to deliver the complexities of HR activities by using outsourcer. They delight in belief: “now it’s their problem.” Their widely experienced specialists will take responsibility for the intimidating, endless vexations associated with human resource management.

David Baker believes that “SHRM has been one of the major developments of this rethinking process. There have been a number of reasons for this. In many organizations, staff costs represent a major proportion of the budget; the cost-effective deployment of personnel must be a key priority in any competitive situation” [2].

Human resource outsourcing is one of the most significant forces affect human resource management. It is normally considered as the permanent contracting out of activities that were performed in-house previously. Business strategy and operational influence generate the trend toward outsourcing.

From strategic perspective, some human resource departments are able shift their focus and resource toward a strategic role through the use of outsourcing. The use of outsourcing human resource is like introduce external market force into the organization, it will result some advantages in reduce bureaucracy and to encourage more responsive and cost-sensitive culture. Besides outsourcing also can be used for political purpose like control head count in human resource [2].

From operational perspective, using outsource is good at create more efficiency or better service in performance of functions. Outsourcing has been seen as a method for cutting cost. The number of human resource specialists in human resource department always been cut while the company during downsizings. In addition, when a specialized expertise is not available in-house, outsourcing can be used to solve the problem.

Human resource management (HRM) refers to the formal structure of an organisation responsible for all levels of the management of human resources. HRM is focused on implements the activities needed to support organisational decisions. In contrast, Strategic human resource management (SHRM) is identified as the process of human resource management that is driven by planning, foresight and analytical decision-making. SHRM is proactive and is focused on vision and developing strategies to achieve a desired state in the future [3]. The position of the HRM is showed in figure 1.

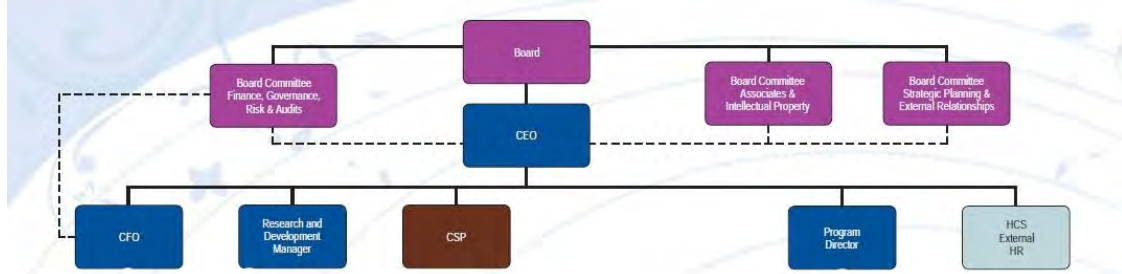


Figure 1 The graph of the organization structure of VACRO

### 3 SHRM Links to the Mission and Vision

The mission of VACRO is to offer support and information for individuals who have been charged with a criminal offence, offenders, prisoners and their families; as well as a leadership, education, training and research on the Justice System for the Community (VACRO annual report, 2009). Therefore, strategic human resource management in VACRO is about to improve their strategic plan for effectively helping criminal through with the right person.

SHRM is important to an organisation’s survival and sustainability because it will lead to improved organisational performance. Effective SHRM have an influence on the organisation when it required changing its overall strategy. It is not just simply follow the organisation’s strategy.

Strategy formulation as an important component in the conceptual framework provides direction to the organization. By an investment perspective, required effective organisational strategies shape and guide the organization to achieve its mission and vision. Human resource management has become a key to obtaining and providing competitive advantage, the rush to competitiveness, and an awareness of the demands of the technologically advanced environment in the future. A successful human resource

management are now considered as a source of competitive advantages. Those advantages can be gained through human resource strategies such as highly developed employee skills, distinctive organisational cultures, management processes, and systems.

Therefore VACRO has committed their service that “the end is essentially the same but the means constantly change”<sup>[3]</sup>.

#### **4 Corporate or Business Strategy of the Real Organization**

VACRO's annual report 2009 shows that VACRO has undergone a period of considerable growth in the areas that they had highlighted after the inception of their strategic plan in 2006, which is VACRO has offered support, information and leadership to assist discharged prisoners across the criminal justice system. The grant funding that VACRO received from ANZ trustees has given VACRO the space to grow and develop. At the next five coming years, their planning will focus on the needs of an expanded client base, the criminal justice system and the wider community.

In this financial year, in order to provide significant capabilities beyond the delivery of their core service and program, they have restructured the organisation and built a research and development function within the VACRO structure, which gives them an ongoing resource and strengthens in the future. These make VACRO as a 'learning organisation'. The VACRO team continually inspired the Council. Meanwhile, staff, volunteers and students worked with passion to the different requirements of Council, colleagues and Council.

The following paragraph will explain how the business managers link the business strategies into the SHRM policies and practices.

Strategic human resource management objectives and plans can be linked to strategic organisational objectives in Cost containment, Customer service, Social responsibility, and Integrity. Cost containment involves the organization reduce headcount, improve expense control, improve productivity, reduce absenteeism and lower labour turnover by focusing on cost reduction. Customer service related human resource development in recruitment and selection, employee training, development, reward and motivation via focusing on achieving improved customer service. Social responsibility and integrity are attempted to improve the organisation's reputation for ethical behaviour and honouring of agreements<sup>[4]</sup>.

#### **5 Organization Structure Showing Where the SHRM Is Linked**

However, organization Structure didn't show where the SHRM is through the information from Varco's annual report and Varco's external HR consultant Mr. O'Grady. CEO and board members should address most important issues in strategic planning. In one company, the CEO is most making critical choice about the company's business portfolio and future strategic direction. In terms of corporate strategy for CEO, there are four different types of activities: strategic thinking, strategic decision-making, strategic planning and strategic execution<sup>[5]</sup>.

#### **6 Recommendations**

It is important that the company can overcome SHRM issues during its future development. One of SHRM issues that Varco faces is human resource department outsourcing. The options to overcome the issues with action plan and discussed as follow. All strategic human resource management objective and activity must be evaluated in terms of how they contribute to the achievement of the organization's strategic business objective, this means that they must: Be measurable, Include deadline dates for accomplishment, Identify and involve the hr customers to ensure the necessary collaboration, Nominate the individuals or parties responsible for implementation.

#### **7 Conclusion**

During this VACRO case study and theory related, we can learn about the difference between strategic human resource management and human resource management, and how the strategic human resource management links to company's mission and vision especially when there is not human resource department in-house. Human resource outsourcing has obtained several competitive advantages in strategy and operational perspective. Further more, in order to develop organization performance, strategic human resource management must be evaluated in terms of how they contribute to the achievement of the organization's strategic business objective.

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# The Varying Roles and Styles of the Change agent

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**Abstract:** This paper discusses about the varying roles and styles of the change agent or facilitator. The paper starts with the definition of a change agent whose roles and responsibilities are also discussed. Next, some key factors about the change process are analyzed: How many steps are involved in change process? How can the companies achieve it? What are the primary and supporting activities and styles adopted by change agent? Furthermore, we provide an example to discuss the organisational case. How and why the change agent is important for the organisational change is further analyzed.

**Key words:** Change agent; Roles; Responsibility; Organisational case

## 1 Introduction

As we can see, the world has been changed rapidly such as the change in globalization, information technology and managerial innovation. The Market and environment are changed by globalization as well as the change of the function the organization operated. Information technology is change patterns of work like how work is performed and how knowledge is used. Managerial innovation merges the change of globalization and information technology, act the influence on organization. Organizations must adapt to these complex and uncertain technological, economic, political and cultural changes. Change agent is important for helping organizations change themselves and responses these changes effectively.<sup>[1][2][3]</sup>

According to Manoj Bhardwaj, “Change agent is a person who leads a change project or business-wide initiative by Defining, Researching, and Planning, Building business support and recruiting volunteers to be part of a Change team”<sup>[4]</sup>. This report will generally express the change agent with its style, responsibilities and function in reality.

## 2 Type of Change Agent

A change agent is usually as a practitioner in organization. At least three type of people relevant organization development practitioner: consultants, content-oriented OD practitioners and organisational staff. Consultants who provide professional services to organization clients exist in internal and external environment. For example, human resource department examine that organization needs someone are capable of turning strategy into reality and demonstrate the value they can contribute to the company. Content-oriented OD practitioners refer to people who specialize in fields related to OD like reward systems, organization design, total quality management, information technology or business strategy. They are working with OD professionals on large-scale project to obtain the experience and competence. Organisational staff refers to the managers and administrators who are able to introduce change and innovation into organization.

## 3 Responsibilities of Change Agent

Change agent focus on the conceptions of planned change which means how change can be implemented in organizations and what action must take place in order to initiate and carry out successful organisational change. A change agent plays a supportive role like guide, educators, facilitators and cheerleaders but not in position to design or lead the project in organization. They create an effective relationship with individuals and groups to help them gain necessary competence to solve their own problems. Typically, internal consultants have their own technical expertise, such as IT enterprises.

## 4 Functions of Change Agent

Usually, change agent plans change process step by step. The steps start with the problem identification. The problems are normally found by an executive who has power and influence in organization. He or she plans the change to solve an existing problem. One of Critical success factors is that there are supports of leaders which have power & authority but not agent.

Next step is facilitating a group meeting, gathering and analyzing appropriate information. Change agent will help them to determine the strengths and weakness of the organization. The OD practitioner



and the client members integrate the ideas into change design and decide what further actions should be taken. At same time, change agent make effort on the program and Encourage client members to lead the change program not themselves.

Meanwhile, the monitor role of change agent regularly measures progress towards the change goals. Change agent will promote buy-in more important change than moving quickly by educating and training client member necessarily. Make the case for change again and again until obtain leadership interest. This is another important success factors for change program.

In addition, a change agent needs to be as a coach sponsor because change cannot be moved without sponsor. The most effective implementation relies on when best understand and support each other. Beside a change agent is able to know how to design and execute an intervention, remove barriers and know how the change is progressing in order to guide implementation. As a change agent, he or she needs to overcome many hurdles to Gaining credibility with Employee such as: Change agent role foreign to Staff; difficult to understand value; typically, agent not a worker; subject to mistrust; Facilitation and encouragement can be perceived as patronizing. OD practitioners will face these dilemmas when they try to joint into organization performance. They have to create the values of trust, collaboration and openness with employee for improving organisational effectiveness and productivity. [5][6][7]

### 5 Valuable Characteristics & Behaviors

As a supporter, Change agent need to make effort to integrate with the client member and also make valuable characteristic or behaviors in performance such as:

- Balance process with results;
- Respect for Managerial as well as subordinate staff;
- Demonstrate active listening;
- Avoid taking personal credit;
- Keep commitments; follow through when asked for help.

Being effective as change agent largely depends on ability to form relationships. Assertiveness: being self-confident without arrogance; having strong belief in what you are doing. Non-threatening: being low-key & supportive; showing that your intention is to help. Trustworthy: showing that you can be trusted from the top to the front line. [8][9]

### 6 Levels of Change Leadership Skills/Styles

A change agent adopts varying styles and skills of leadership to adapt himself to various situations and steps in the change process to bring about an effective change. He or she does the following in the process of facilitating the change:



**Figure 1 The Change Agent Styles Can Be Explained Clear Through The Below Given Change Agent Style Matrix.[10]**

- Accepts the requirement for change communicates and examines the need for organization development which means small change initiatives with clear direction.
- Defines and starts, identifies the key point in changing program which means change projects at local level.
- Transformation of central vision into change initiatives & organization-wide communication.

- Generates change with a high degree of transformation.
- Ability to revolutionize organization.

## 7 Theory in Practice

- The firm: treasure unlimited;
- An exporting firm;
- Problem perceived: return of stock send due to delay;
- Reason perceived: irresponsibility of dispatch staff;
- Reason for inviting change agent: increase morale of dispatch Staff
- Problem identified: technical issues; mainly machine failure and communication error.

For example, in reality the problem that was perceived turned out not to be the real problem. The real problem was hidden underneath and that is mostly the case with many of the organization. The identification of the real problem not just by the change agent but its acceptance by the employees and the management is the greatest challenge faced by the change agent especially when the problem underlying reveals some of most sensitive issues in the organization. In such cases, the action oriented activity group to participate in identifying the real problem can be one of the best approaches to tackle the issue. The change agent may use intriguing questions to bring light into the real issue but make sure the answer comes from their part.

## 8 Conclusions

To sum up, Change Agent is a person who tactically performs the multi roles through marginality. They may be people who are relevant organization development practitioner like consultants, content-oriented OD practitioners or organisational staff. They develop, collect and share tools to help Group Dynamics among the Management, Managers, Employees and Change Agent define and achieve their goals. Change agent need to facilitate vertical installation of effective communication system between manager and employees as analyzer or pathfinder. Based on the research of environment and social change, change agent assist in provide appropriate mixture of styles and roles to makes the change effective and sustaining in the organization.

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# On Flexibility Management's Application in Modern Hotel Management

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**Abstract:** The Chinese hospitality industry has developed into a new stage, in which management innovation is required to create a competitive edge. This article proceeds with flexibility management theories, incorporates characteristics of hotel management, proposes the notion of hotel flexibility and constructs a flexible management system plus a set of evaluation indicators on this basis. In addition, SFA (Stochastic frontier approach) was employed to conduct empirical research on management efficiency of selected hotels in Beijing. The research findings have proven that hotels with high ratings in the flexible management system have functioned in a more efficient way than their counterparts.

**Key words:** Flexibility management; hotel flexibility; dynamic humanistic dimensions; SFA

## 1 Introduction

### 1.1 Development of chinese hotels and emerging challenges

The Chinese hospitality has undergone the burgeoning (prior to the 1980s), inception (1980-1982), rapid growth (1983-1993), setback (1994-1998) as well as the recovery and rise (after 1999). By now, this industry has roughly gained maturity, with starred hotel, ordinary hotel and budget hotel roughly classified as the three basic categories. The first category that is relatively well developed has acted as the pillar and specimen of this industry.

Chinese hospitality industry at this developmental stage is mainly confronted with the following challenges: firstly, the intensified competition; secondly, ever-increasing hotel cost; thirdly, clients' ever growing requirements for customized service. All these challenges have ushered in a stage of connotative development, in which hotels are expected to obtain competitiveness through management innovations. The concept of flexible management of hotel is proposed in this context.

### 1.2 Brief introduction of flexible management research

Western scholars are primarily focused on the construction of FMS (flexible manufacture system) in research on flexibility and flexible management. Their secondary focus includes strategic management and operation management. Strategic managerialist Ansoff (1988) was one of representatives for early research on flexibility theories<sup>[1]</sup>. He brings up two modes of flexibility, inner flexibility and outer flexibility. Volberda (1996) emphasizes that flexibility is a product of inner and outer pressure of a certain organization, as well as dynamic management competence on the strategic, structural and operational levels<sup>[2]</sup>. Gerwin (1993) explores the operation and management issues of flexibility construction system<sup>[3]</sup>. Research on flexibility and flexible management in service arena was initiated in the middle and later 1990s. Fitzsimmons (2001) believes that the success of a service organization is based on how much flexibility has been incorporated in the service<sup>[4]</sup>. Harvey (1997) studies the flexibility-related technical problems in service-oriented enterprises and creates a model concerning management flexibility<sup>[5]</sup>. All these researches are enlightening for the forthcoming researches on flexible management of hotels. Domestic scholars such as Zheng Qixu (1998) and An Yingmin (2008) have also brought up their own ideas concerning flexibility and flexible management. Their opinions are highly representative of the domestic research in this field. Both scholars stress that flexible management is human-oriented, involving encouraging the employees to take their initiatives to counterbalance the drawbacks of inflexible management<sup>[6][7]</sup>... In the domain of service management, Chen Rongping (2006) makes a breakthrough by constructing a framework pertinent to the notion and theory of flexible notion, and conducts a theoretical analysis of service flexibility and its management in a relatively systematic way<sup>[8]</sup>. Chen's framework and analysis provide significant references for the definition of hotel flexibility in this thesis.

This thesis explores the notion and connotation of hotel flexibility and its management on basis of flexibility theories, and further constructs a hotel flexible management system and an evaluation index system. Besides, this thesis also involves an empirical analysis of flexibility management of certain hotels in Beijing by use of this index system and a further exploration of the relationship between flexible management and management efficiency of hotels.

## 2 Hotel Flexibility Management System

### 2.1 Definition of hotel flexibility and its management

This thesis defines the hotel flexibility based on a review of thoughts by domestic and foreign scholars. The hotel flexibility should be interpreted as a capability through which the hotel could make efficient response to changes in exterior environments by replying on the staff initiatives. Hotel flexible management refers to a process in which the hotel draws upon common values, inner culture and enterprise spirits of its organization to optimize the inner resources, innovatively improve flexibility of all the levels and enhance the enterprise's capability and flexibility to respond to changes.

Hotel flexible management is built on a combination of human-oriented management and dynamic management. The former notion is determined by the hotel's identification as a service institution: accordingly, the expertise and experience of the employees are not easy to replace; meanwhile, added values created by the employees during the serving process are the major component of the creation of client-oriented values. The key to enhance service quality lies in whether the hotel can take non-compulsory measures to trigger a sense of recognition and initiatives on part of its employees so that organisational will can be translated into voluntary behavior. Dynamics refers to the management which is aimed at encouragement, maintenance and improvement of the enterprise's flexibility, sensitivity, responsive speed and adaptability so that the hotel can obtain competitive edge in face of changes in outer environments.

In essence, it can be concluded that the connotations of hotel flexible management includes the following aspects:

(1)The objective of hotel flexible management is to improve its dynamic management capability to obtain competitive edge;

(2)The basis for hotel flexible management is to enhance the flexibility of its employees;

(3)The core of hotel flexible management is the creation of client-oriented values;

(4)The methods to realize hotel flexible management is re-creation.

### 2.2 Classification of hotel flexibility and index evaluation model

Hotel flexibility can be further classified into that of employees, of the whole organization, of the service system and that of information which functions on all the aforementioned levels.

#### 1)Flexibility of Human Resources

It is the inner origin and an integral component of hotel flexibility. The "human resources" factor, in the context of a hotel, can be further categorized into three parts, including the manager, core employees and periphery employees. The three parts construct a man-oriented flexibility system of a hotel through mutual influence in the process of information transfer.

#### 2)Flexibility of Organization

It is concerned with a capability which is founded on basis of man-oriented flexibility and relates to timely response to changes in the outer environment. It mainly takes the form of flexibility and adaptability of the organization. Organisational flexibility mainly manifests itself in the changes in organisational structures. The transformation from traditional inflexible hierarchy to an organisational structure featuring one level and networking captures the developmental trends of organisational structure of modern enterprise. The organisational flexibility concerns both the flexibility in the organisational structure but also the existence of non-formal organization. Efficient non-formal organization can release angry caused by existing or potential fractions and conflicts. Meanwhile, intensive exchanges between employees in such organizations help to exert creativity appease anxiety and reduce confrontations.

#### 3)Flexibility of Hotel Service System

Such flexibility is mainly reflected in the flexibility in service design, service products and service process. The core is the capability of fast response founded on the client-oriented values. Flexibility in service design concerns the competence through which the hotel can adjust and modify service provided based on its strategic position according to changes in operational environment. Flexibility in service products concerns the ability through which the hotel can develop new products or adjust existing products in order to meet the clients' requirements. Flexibility in service process refers to the capability to make efficient adjustments of service transfer system to satisfy changed requirements.

#### 4)Flexibility of Information

This refers to a competence relying on which the hotel can disseminate, store and manage information on all levels in an efficient and timely way, and make adjustments to its own information system.

Based on the hotel flexible management index system, the first-class indexes include the flexibility of human-resources, of the organization, of the service system and of the information. The second-level indexes encompass the flexibility of duties and responsibilities, quantity, time, and salary; the flexibility of organisational structure, of authority decentralization, and of non-formal organization; the flexibility of service design, service products, service process; flexibility of information formation, and of information transfer. In this thesis, an HFI index (hotel flexibility index) was constructed on basis of questionnaire and consultancy from the experts.

### 3 Empirical Research of Flexibility Management Efficiency

#### 3.1 SFA<sup>[9]</sup>

In the SFA formula, the cost of an economic institution is determined by output (y), factor price (w), cost efficiency (u) and random error (v), just as follows:

$$C = C(y, w, u, v) = C(y, w) \exp(u + v) \tag{1}$$

The error factor (u + v) consists of two parts. u, reflecting the inefficiency of operation and management, is uni-directional. It is no smaller than zero in the SFA functional model of cost, and no bigger than zero in the SFA functional model of production. Its distribution functional model mainly takes the half-normal form or trans-log form. v is bi-functional, signifying the white noise in random shocks and statistics. It is commonly distributed in a bi-directional and normal way, with an average of zero and variance of D. CE (cost efficiency) can be calculated by the ratio between minimal cost and actual cost.

$$CE = C^{min}/C = C(y, w) \exp(v) / C(y, w) \exp(u + v) \tag{2}$$

Based on formula (1), and the research methods of Ching-Fu Chen<sup>[10]</sup>, a SFA Cobb-Douglas functional model of cost in the broad sense is stated as follows:

$$\ln TC_i = \beta_0 + \beta_1 \ln w_{i1} + \beta_2 \ln w_{i2} + \beta_3 \ln r_i + \beta_4 \ln TR_i + \beta_5 \ln OR_i + \beta_6 \ln VFR_i + (u_i + v_i) \tag{3}$$

In this formula, r<sub>i</sub> represents the capital price of the hotel's fixed assets, w<sub>i1</sub> is the average salary of the employees, and w<sub>i2</sub> is the consolidated price of raw materials. TR<sub>i</sub> is the total annual income of various hotels. Effective variables include occupancy rate (OR<sub>i</sub>) and unit area value of Food and Beverage Department. The total cost TC<sub>i</sub> is a variable. Assume that cost frontier and input price observes linear homogeneity. The SFA functional model of cost in the empirical research can be set as a half-normal form. Likelihood comparison measurement can be used to assess the significance of coefficient estimate. The ratio for standard deviation between u and v, the ratio between u and σ<sub>v</sub><sup>2</sup> are both important indexes to measure the relative inefficiency, and deviation between management inefficiency and white noise, which can be calculated with λ = σ<sub>u</sub>/σ<sub>v</sub> and γ = σ<sub>u</sub><sup>2</sup>/σ<sub>v</sub><sup>2</sup> respectively. Generally speaking, λ ≥ 1, 0 ≤ γ ≤ 1. The larger λ, the closer γ is to 1. Management inefficiency occupies a larger quota.

#### 3.2 Empirical research data

##### 1) Samples

In this article, fifteen starred hotels were sampled as subjects of studies. Their cross-sectional data in 2009 was used to construct the SFA functional model to evaluate their operation and management efficiency.

##### 2) Estimation of SFA Functional Model of Cost

Based on the maximum likelihood to estimate Formula (3), one can come up with the estimation index as shown in Table 1.

**Table 1 Cobb-Douglas SFA Index Estimations of Certain Hotels in Beijing**

Variables	Index Estimations	T-Statistic	Corresponding Statistics	
Constant Term	- 3.2913	- 3.2431	σ <sub>v</sub> <sup>2</sup>	0.0030
lnwl	0.4245	6.3128	σ <sub>u</sub> <sup>2</sup>	0.0784
lnwo	0.2976	3.0126	γ = σ <sub>u</sub> <sup>2</sup> /σ <sub>v</sub> <sup>2</sup>	0.9628
lnr	0.3687	4.9331	σ <sup>2</sup> = σ <sub>u</sub> <sup>2</sup> + σ <sub>v</sub> <sup>2</sup>	0.0815
LnTR	0.8985	12.3298	λ = σ <sub>u</sub> /σ <sub>v</sub>	5.0876
OR	0.2372	2.7892		
LnVFR	-0.5787	-7.5721	Sample Size	15

##### 3) Estimation of Hotel Management Efficiency

By calculating index estimations and indexes for various variables of sampled hotels, one can estimate  $u$  of every sampled hotel. Based on Formula (2), one can estimate their CE (Table 2).

**Table 2 Estimates of CE in Some Beijing Hotels**

Hotel Numbers	CE	Hotel Numbers	CE	Hotel Numbers	CE
1	0.92	6	0.75	11	0.65
2	0.96	7	0.86	12	0.77
3	0.87	8	0.84	13	0.76
4	0.89	9	0.73	14	0.75
5	0.78	10	0.8	15	0.82
Max: 0.96   Min: 0.65   Average: 0.81   Standard Deviation: 0.065					

#### 4)Comparative Analysis

By conducting a comparative analysis of CE estimates of sampled hotels and their flexibility management index, it can be identified that flexible management and CE observe a positive correlation relationship, which means that flexible management can enhance the management efficiency of a given hotel.

## 4 Conclusion

Empirical research findings have proven that overall management efficiency of sampled hotels in Beijing needs improving, and that flexible management has a positive correlation relationship with management efficiency. Enhancing the construction of flexible management system in a given hotel can improve its management efficiency in an effective way. Following researches can adopt the following perspectives: firstly, empirical analysis of how various factors concerning hotel flexible management influences management efficiency, which is aimed at further clarifying key factors for construction of hotel flexibility; secondly, quantitative analysis of cost for hotel flexible management.

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## Evaluation of the Impact of R&D Tax Incentives on the Propensity to Innovate

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**Abstract:** This paper analyzes the effects of R&D tax incentives on the propensity to innovate of Spanish firms. We wonder whether transmission of inputs into outputs in the innovation function depends on public policy incentives. These policies can affect firms' decisions both at the extensive and intensive margins and transmission could go to sales, employment or productivity. We match data from the Survey on Business Strategies and tax records from the corporate tax and we conduct several exercises trying to identify causal effects. The results show that public policies have some impact on the use of private funds and on the promotion of innovation in big firms but they do not either affect the propensity to innovate or modify the behavior of small firms. As a result, we propose to make a deep revision in the design of the system of fiscal incentives in order to allow small and medium firms benefiting more from it. Since the firm structure of the Spanish economy is dominated by small and medium firms any progress on R&D effectiveness will depend on the behavior of those companies.

**Key words:** innovation, tax incentives, impact, evaluation

### 1 Introduction

Why Spain does not really progress as much as other EU countries in R&D issues? After the effort during the last decade of national, regional and local governments to create incentives and grants to foster private innovation activities, we still present a gap with other OCDE countries. According to OCDE data, Spain is located in 2010 at the position 29<sup>th</sup> out of 34 countries as regards innovation effort with a volume of internal R&D relative to GDP of 1,38 percent far away from OCDE average of around 2,40 or UE27 average of 1,90. Although we have to consider that most OECD countries depart from higher initial values, the evolution of this figure for Spain during the period 2003-2010 show a 39 percent increase while it is 6 percent for the OECD as a whole.

The Lisbon Strategy created the fundamentals of growth and employment based on knowledge. However, a huge unemployment rate and a low level of innovation activity are still two characteristics of the Spanish economy. In one side public policies have failed to stimulate innovation activities and on the other side, private investments have not developed sufficiently to create added value for job creation through this channel.

The generation of new ideas is supported by the production of information and knowledge that enhances in itself as a public good, since the information is non rival and non excludable. Usually, two reasons justify government intervention in enhancing private innovation activities. First, the difficulties that firms face to finance their R&D projects; second, the problems with appropriability of R&D returns. When they perceive that for some reasons the costs are higher than the benefits stemmed from that investment the incentives to invest are reduced.

If whatever of those factors are relevant to the private firm' investments, we should observe in an ex-post assessment that firms recipient of fiscal incentives innovate more, on average. There exists a wide empirical research in Spain<sup>1</sup> and in other countries<sup>2</sup> concluding that fiscal incentives have positive effects on innovation at the extensive and intensive margins. There are also differences in these conclusions, however, because frequently the results are very sensitive to data, methods and empirical specifications. We propose a more accurate evaluation of such programs and policies using complementary data sources. It is important at this moment where the main objective of governments' actions is fiscal consolidation of public deficits to provide accurate evaluation of the impact of public policies. That assessment should not set up to leave away those programs, but to take into consideration the limitations of the actual design, possible deviations from initial objectives, errors in the allocation of

<sup>1</sup> In Busom, Corchuelo and Martínez Ros (2010) show an evaluation of effects of different public policies on the private R&D investment. In the same volume, we can find other studies which also evaluate the impact of the direct funds of firm R&D.

<sup>2</sup> Berubé and Mohnen (2009), Czarnitzki et al (2011) or Lokshin and Mohnen (2011).

grants, etc. We have to bear in mind that the final goal of those policies is improvements of Spanish economic competitiveness, creation of jobs and at the end of the day increases in social welfare of the country.

Our paper focuses on the study of the effect of R&D tax incentives on the propensity to innovate through changes in the inputs of the innovation production function (R&D expenditure or employment in R&D). Moreover, we postulate that if we observe those changes they should translate to modifications in firm performance as an indirect effect of fiscal policies. We propose to relate them to firms' productivity in order to analyze the capacity of a public program to transfer its benefits into production, sales or employment. Our study is divided in two well defined and different parts. The first one describes the Spanish situation and compares it with the situation in OCDE countries. In the second part we do an econometric and a simulation exercises using a novelty sample of registers providing information about the corporate tax with the aim of using real data for testing our hypotheses and proposing, when necessary, alternative schemes for public programs.

We plan to use two different data bases to carry out this analysis. The "Encuesta Sobre Estrategias Empresariales" (hereafter ESEE), is a survey of around 2000 manufacturing companies in the period 1990-2008. It is an anonymized panel, which no possibility to identify firms. This survey is representative for large firms because it is a census but for a small firms is a sample with some problems of representativeness.

The second data base is a sample of registers of the corporate tax in 2008 provided by the Spanish Instituto de Estudios Fiscales. Those registers allow us to evaluate alternative tax credit policies as well as check their sustainability for the public budget. In this information we know the initial situation in terms of fiscal cost and the tax deduction policy that firms use, so we are able to suggest changes in the schemes of tax policy because we can follow the firm according to sector and volume of sales. Results of such exercises provide us the possibility to assess the effect of changes in the R&D tax incentive policy on the propensity to innovate of Spanish manufacturing firms.

## 2 Prior Literature

In the public programs and policies supporting R&D activities there are several alternatives from the promotion of basic research for the knowledge production to those oriented to reinforce launching new products to the markets. In all cases, those instruments try to overcome market failures derived from private initiative that do not confer effort to those activities without enough returns in the short or medium term or when there exist problems of imitation that threat the appropriability of the returns of innovation.<sup>1</sup>

Fiscal incentives are one of the most used instruments by many governments to lower the user cost of R&D and thereby stimulate business investment in research and development. Market failures due to R&D externalities and asymmetric information between lenders and borrowers for financing R&D projects are often cited to justify the existence of such government programs, which often involve substantial tax burdens (OECD, 2007). The effectiveness of R&D fiscal incentive programs, however, continues to be the object of intense debate among economists (Lokshin and Mohnen, 2010). Those instruments are articulated through the fiscal law (Corporate Tax) with the object of reducing the cost of investment and increasing private profitability, trying to achieve a balance between social and private production of R&D. However, an important issue as European Commission recognizes (2003) is the vast of designs inside countries which implies a key point to compare their effectiveness.

Following the international index of Warda (2006) we can affirm, a priori, that the Spanish fiscal system is one of the most generous. Corchuelo (2006), Heijs *et al.* (2006), and Marra (2007, 2008) concur that Spanish tax incentives reduce the cost of capital in R&D. In a recent paper, Busom *et al.* (2011) analyze a combination of public policies and find a positive effect of such policies but they conclude that firms face important limitations to their use due to several obstacles as financial restrictions or limits in appropriability. So, an interesting research question could be how a redesign could make them more attractive for firms and affect their decisions to use them more efficiently and invest more in R&D activities.

In 2003 a report from IDETRA and CEIM set up to Ministry of Economy and Finance the

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<sup>1</sup> It is difficult to imagine the private initiative dedicating funds from the first stage to the study of DNA 25 years ago since profitable discovers have not provided benefits to the society until now. We need from public policies to promote research and development at basic and applied level, sometimes even in the presence of high levels of uncertainty in the returns.



existence of difficulties to apply R&D deductions by the firms in terms of interpretations and required conditions. Because the number of firms making use of such incentives is not very high, we should try to investigate about the reasons behind this behaviour, given the theoretical simplicity of the scheme. Corchuelo and Martínez-Ros (2008, 2010) show the participation of firms in the tax credit system and conclude that despite knowing the advantages of the program, they frequently prefer do not make use of such tool. The percentages of use are around 20% for SME and 40% for large firms. Behind different arguments about non participation in these R&D tax incentives, Corchuelo and Martínez-Ros (2008, 2010) conclude that is it crucial for non-participating the volume of information firms should provide to the Tax Agency that could increase the probability of further inspections. However, to our knowledge, the most important barrier to the entry into these programs is the complexity of the rules and the tax scheme for the actual Spanish business network with a 60% of SME, with a majority of family business or micro firms.

In 2009, the Ministry of Science and Technology order a new report about the comparison of different systems of R&D Incentives in OCDE countries. From this report, we can extract that Spanish firms intensive in R&D can accumulate tax credits but they never can fully apply, like small innovative firms, technological start-ups or large firms with huge amounts of R&D investments. So, our aim is evaluating how aspects related to the design of the instrument can affect firms' decisions and how changes in the design of public programs and policies can improve access to and use of them. A second important key point of this report relies on the cooperation between the private-public sectors. For example, the tax credit allows the deduction of internal employment dedicated to R&D but not the external one, then if a firm has collaboration with a Research Center hiring part of the personnel the firm could not reduce it from the cost of R&D.

### **3 Data sources**

In this section we describe the two different data sources that we use to carry out our analysis.

#### **ESEE 2001-2008**

We use data provided by the SEPI Foundation on behalf of the Spanish Ministry of Industry, Tourism and Trade. This survey contains data from 1990 on manufacturing firms with more than 10 employees, which are questioned about their strategies in the short and long run, including their R&D decisions. Since 2001, this survey has included some questions about the knowledge and use of tax incentives for R&D that allow us to distinguish between firms that merely are aware of these incentives and firms that actually use them. Because of some problems with answers in 2001, our research refers to the year 2002, although we measure some variables for the period 1998 to 2002. Our final sample includes 1708 observations at the firm level.

#### **Registers from the Corporate Tax – 2008**

These database has been provided to us by the Spanish Institute for Fiscal Studies and it consist in a random sample of administrative records for firms with a business volume below the threshold of 8.000.000 € in 2007. This sample represents 85% of the total population in terms of activity whereas in size it is representative of the 93.5% of SME related to the ESEE survey. It contains 302.031 companies but only 697 report expenditure on R&D with 33.7% belonging to the manufacturing sector.

## **4 Empirical Exercise**

### **4.1. Research questions**

In this section we set up some empirical questions with the spirit to evaluate whether the objectives of fiscal policies are well fitted according to their initial design. The concession of public funds to R&D entails the well known crowding out effect where private investment could be substituted or replaced in part by the incentives since they minimize the costs. Recently, there exist a vast literature paying attention to this phenomena (for tax credits: Bloom, Griffith and Van Reenen (2002); Lokshin and Mohnen (2011); Czarnitzki, Hanel and Rosa (2011); Duguet (2012); for direct grants or subsidized loans: Gelabert, Fosfuri and Tribó (2009); Czarnitzki, Ebersberger and Fier (2007); Cappelen, Raknerud and Rybalka (2011)), but with mixed results about the effectiveness of the fiscal policies on innovation activities. Hence, our research questions explore about the relationship between public and private R&D funding, not in cause-effect terms but in terms of comparison among the provision and use of different funds by the companies.

We are worried about these issues in the empirical exercise and so we wonder about complementarity in the use of public – private funds, presence of external spillover effects and changes

in behaviour induced by public policies. In this sense, we like to answer the following three questions:

- RQ1: Does public funding complement or substitute R&D private funding?
- RQ2: Does public funding -tax credit- create incentives or conditions to compete among firms?
- RQ3: Does public funding –tax credit- modify the behavior of firms to start with innovations?

#### 4.2. Methodology

In the literature there are two main approaches to the evaluation of the effectiveness of R&D tax incentives. The first approach is based on the estimation of a demand for an R&D equation that depends on a user cost of R&D that is itself a function of R&D tax credit parameters (Bernstein 1986; Hall 1993; Bloom et al. 2002; Mairesse and Mulkey 2004 or Baghana and Mohnen 2009). This named structural method allows adjusting and distinguishing short run from and long-run effects and then one can make assumptions about the evolution of the tax policy with simulation purposes. The main econometric problem is the endogeneity of the R&D tax credit variable such that instrumental variable estimations are needed to provide consistent results. The second approach estimates the treatment effect by using factuals or counterfactuals, comparing treated and control firms before and after the introduction of a policy change. Within this methodology, there is a variety of procedures as matching methods (Czarnitzki et al. 2004; Duguet 2008), instrumental variable estimators (Cappelen et al. 2008 or Corchuelo and Martínez-Ros 2008), difference-in-difference procedures (Cornet and Vroomen 2005) or regression discontinuity designs (Haegeland and Moen 2007). In all cases, the aim is to compare the average R&D effort of firms that receive R&D tax credits with the average R&D of firms that do not but that are otherwise similar. The use of different methods depend on the conditional independence assumptions, i.e., comparing firms having the same likelihood of receiving R&D tax credits or are near (just above or just below a threshold of eligibility of receiving).

We will use the second approach and in order to have a first feeling about the answer to the proposed questions, we first present different descriptive statistics. They only provide correlations among the variables and thus they inform us about trends but we are looking at causal effects. It has been common in this literature to attribute causality to the effects obtained for variables measuring public policies in the context of discrete choice models. We are aware that those variables are far from being strictly exogenous because accessing or applying for a public policy could be non-randomly. Either the distribution of funding results generates non-random samples or the decisions to apply are endogenous. In addition to test and correct for sample selection, we give a further step through instrumental variable techniques. All results point out towards the existence of impact of the policies only for big firms. Since our corporate tax database contains information of all regions and some region in Spain are subject to different corporate taxation (region 1, say), we use the counterfactual that firms in all regions behave the same way concerning tax incentives and we use the figures for firms in region 1 to simulate results for firms in region 2 (those with different tax scheme). This experiment allows confirming econometric results. Finally, we use simulation techniques to check whether alternative policies of tax credits (like that in region 1) are sustainable for the public budget at this moment of crisis.

### 5 Results

In this section we try to answer the three questions exposed earlier using the different methods explained. As a first step, we have calculated the evolution of total and internal expenditure in R&D by employee splitting the sample by size and by technological sectors and comparing companies with public aids and without them. We report this information in Table 1.

In Panel A, we clearly observe that for SME public funds do not represent a complement to private investment while for large firms are tax credits more than direct funds what really incentive their effort to invest on R&D. This result has to be taken carefully since it is only a description and it does not inform us about a causal effect. However, we consider that it constitute a good starting point, since joint with results in Panel B, we can infer the same implications. Moreover, a graphical description in Figure 1 helps confirming this phenomenon.

**Table 1 Changes in the evolution of R&D effort**

R&D Expenditure per Employee				
PANEL A	PYMES		GRANDES	
	Total	Internal	Total	Internal

With TC in 2008 & 2007	87.6	38.1	27.6	19.8
Without TC in 2008 & 2007	5.8	3.70	34.5	67.7
With DF in 2008 & 2007	41.2	59.6	13.5	24.6
Without DF in 2008 in 2007	25.1	5.70	43.5	48.3
With TC & DF 2008 in 2007	20.8	24.9	6.2	1.10
Without TC & DF in 2008 & 2007	-1.84	-13.0	37.7	50.6
<b>PANEL B</b>	<b>High Tech Industries</b>		<b>Med-Tech Industries</b>	
	Total	Internal	Total	Internal
With TC in 2008 & 2007	30.7	56.9	30.4	38.5
Without TC in 2008 & 2007	28.6	29.1	32.3	28.7
With DF in 2008 & 2007	25.3	54.8	28.2	35.7
Without DF in 2008 in 2007	30.4	30.3	28.7	39.0
With TC & DF 2008 in 2007	28.5	62.4	30.3	38.7
Without TC & DF in 2008 & 2007	30.2	30.6	33.4	32.1

Nota: TC means Tax Credits, DF means Direct Fund.

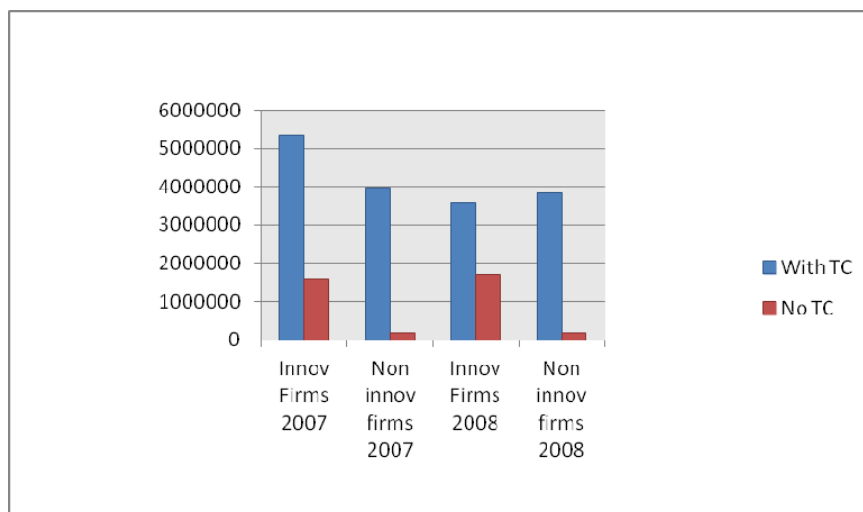


Figure 1 Total Average R&D Expenditure

In this picture we observe that successful innovating firms with tax credits in 2008 reduce their total R&D expenditure whereas similar innovating firms without tax credits increase their expenditures. For non-innovating firms, the public program of tax credits does not contribute to change the behavior of companies. This is the first point to think that perhaps this program really needs a complete redesign since it does not report significant changes besides the continuous efforts by the Central Government to push firms to invest more in R&D.

In Table 2 we report the last descriptive analysis corresponding to measures of innovation outputs. We check whether firms introduce product or process innovations comparing the observed probability in the treated group (with public support) and in the control group (without public support). As we see, large firms need less help from public programs than small – medium firms, in general. However, we observe that the funding is important for large firms in the Medium Tech industries. It constitutes a surprising result that the higher propensity to innovate corresponds to firms belonging to High Tech industries which do not receive public support.

**Table 2 Propensity to innovate by size and sector**

	SMEs		LARGE FIRMS	
	2007	2008	2007	2008
With funding <sub>t-1</sub>	83.3	62.5	64.0	79.3
Without funding <sub>t-1</sub>	33.8	28.3	54.3	55.7
	High Tech Industries		Medium Tech Industries	
	2007	2008	2007	2008
With funding <sub>t-1</sub>	14.3	66.6	88.9	81.8
Without funding <sub>t-1</sub>	54.9	53.8	51.5	50.0

In the next analysis using discrete choice methods we try to shed more light to the yet uncover questions. This analysis is carried out using the ESEE but since we plan to check these results using a simulation exercise with data from the Corporation Tax, we restrict our estimating sample to those firms with the same business volume (form small firms less than 8 millions Euros) to be consistent in the comparisons as well as to be able to use parameter estimates in subsequent simulations.

**Table 3 Results for innovation decisions**

SMEs		
Dep. Var: Dummy of Innovation in Product or in Process	dy/dx	Stand. Error
TC <sub>t-1</sub>	0.032	0.041
L(R&D) <sub>t-1</sub>	0.024***	0.002
High –Tech Ind.	0.102***	0.032
Med-Tech ind	0.050**	0.023
Log Empl	0.043***	0.009
Capital int..(*100)	0.001***	0.001
Export	0.110***	0.012
No self-managed	-0.033***	0.012
Foreign capital	-0.036	0.041
Firm age	-0.001***	0.000

LARGE FIRMS		
Dep. Var:	dy/dx	Error Standard
Dummy of Innovation in Product or in Process		
TCt-1	0.086***	0.020
Log(R&D)t-1	0.024***	0.001
High-Tech Ind.	-0.076***	0.024
Med-Tech Ind.	0.025	0.020
Log Empl	0.033***	0.009
Capital Intensity (*100)	0.002***	0.001
Export	0.031	0.024
No self-managed	-0.072***	0.019
Foreign Capital	-0.030*	0.017
Firm age	-0.001**	0.000

We estimate equations where the dependent variable is a dummy reporting the introduction of product or process innovation by firms and where our explanatory variable of interest (TC) is a dummy equals to 1 if firm uses tax credits and 0 otherwise. These equations include other controls as size, sectors dummies, dummy for exporters, capital intensity, etc. The equations are separately estimated for SME and large firms. We report marginal effects in Table 3.

For SMEs, fiscal incentives in the form of tax credits do not contribute to increase the probability to innovate, while for large firms this probability increase 8.6 per cent. To confer validity to these results we address some robustness checks: for habitual users of tax credits, for entrants and exiters of those policy and we confirm previous results. We also take into account possible endogeneity due to sample selection and estimate the specification by instrumental variables, and also using a Heckman's type sample selection model (Heckman, 1979), obtaining again the same results. The results are also similar in the context of cross-section and when we use the data in its panel form assuming that the heterogeneous effects are random.<sup>1</sup>

Our last analysis constitutes an experiment but could be an indication of which direction a policy maker should re-address the design of fiscal policies. We can identify in our data firms belonging to the different Spanish regions in a way such that the tax credit scheme is different for firms in the Basque Country and the rest of firms.<sup>2</sup> We name the common fiscal regime as the Spanish model while we name the fiscal regime of the Basque Country as the French model because it is the same applied in France. While the Spanish model sets limits to the tax credit (up to a maximum of 50% of the amount to deduce), the French model reimburse all investment made on R&D.

The idea is to assess whether exist differences in the propensity to innovate when we change the scheme of deductions. So, we randomly assign to firms of the rest of Spain the index of use of tax credits that firms in the Basque Country have using as indicators the industry to which the firm belongs to and its size (volume of activity). This random assignment applies up to the point in which the samples for both regions have the same propensity to ask for tax credits.<sup>3</sup> Then, we re-estimate the model using

<sup>1</sup> All these sets of estimates are available upon request.

<sup>2</sup> This is so because there are two different fiscal regimes in Spain, one corresponding to the Basque Country and Navarra regions (known as *régimen foral*) and another corresponding to the rest of regions (known as *régimen común*).

<sup>3</sup> The propensity to apply for tax credits is 25% higher in firms operating in the Basque Country.

this new generated variable. The results we get in this experiment are for SME for TC is 0.020 (standard error 0.03) and for large 0.094 (standard error 0.02). They compare to those presented in Table 3 and we again can conclude that the new scheme does not modify behavior of firms.

There is another alternative scheme known as the Canadian model where the reimbursement is for all investment made on R&D which is more costly than the Spanish and French ones. Although we cannot make an exercise like the previous one because we do not have any firm applying the Canadian model within our database, we simulate as a last exercise the costs of the three models for the public budget. Whether they are sustainable or not could affect policy decisions of changing the design of the current policy. The costs of the three schemes are presented in Table 4. We have to take into account that this data base represents 85% of firms which the volume of annual revenues is lower 8 millions of Euros and only 4.20% get tax credits. Using the simulation figures, we can conclude that for SME any of the alternative fiscal incentive policies would be sustainable. Whether or not they are going to produce impact on the propensity to innovate of Spanish firms is still a question which requires additional evidence.

**Table 4 Costs of the current and alternative policies**

	Nº of firms	Canadian model	French model	Spanish model
TOTAL	697	98.740.444,59	22.227.410,32	14.134.293,09
From 1 to 10	35	4.344.620,9	65.289,64	34.158,23
From 11 to 25	286	27.557.217,98	7.465.969,68	3.997.604,31
From 26 to 50	205	29.126.435,8	8.271.217,62	5.743.924,69
From 51 to 100	125	26.721.698,55	2.880.446,5	2.169.716,67
From 101 to 250	36	7.326.678,3	2.914.992,89	1.883.578,07
More than 250	10	3.663.793,06	629.493,99	305.311,12

## 6 Conclusion

The effort of governments to stimulate the generation of knowledge and ideas in the Spanish economy in the last decades does not seem to produce the expected fruits at the light of macroeconomic R&D figures. Indeed, we do not improve our position in the UE or OECD and the incentives did not produce the benefits to the system in order to alleviate the low private level of investment on innovation activities. Hence, it is obvious for a policy maker to assess about the effectiveness of that policy. Our results are not conclusive but show a certain pattern of deficiencies of our fiscal system as regards in this case its scheme of tax credits. With all the caution, we observe from the empirical analysis that for large firms the tax credits stimulate the propensity to innovate in product or in process increasing figures in a marginal magnitude of 8%. This is not the case however for SMEs and we feel that a new design of this public program is necessary to stimulate this activity in the size segment where most of the Spanish operate. Another important need that we feel as necessary for stimulating R&D activities is the public – private collaboration.

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# Development and Construction of China Industry Technology Innovation Strategic Alliance: Taking Visico Alliance as an Example \*

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**Abstract:** Based on the literature review, this paper takes Visico Alliance as an example to analyze the status-quo, organizational structure, mode of operation, capital investment, fund management system, the internal communication and cooperation situation in China industry technology strategic alliances. Moreover, the paper attempts to explore the intrinsic and important factors influencing the development of industry technology strategic alliances, and puts forward the countermeasures and suggestions to promote the healthy and sustainable development for China industry technology innovation alliance.

**Key words:** Industrial technology innovation strategic alliance (ITISA); Organizational structure; Mode of operation; Capital investment; R&D needs

## 1 Introduction

The development of Chinese industry innovation alliance was officially opened in December 2008, when the “Guidance regarding the promotion of building industrial technology innovation and strategic alliances” was jointly issued by the six ministries of China (the Ministry of Finance, the Ministry of Education, Ministry of Science and Technology, the State Council, the SASAC, the All-China Federation of Trade Unions, the National Development Bank). Based on the industrial innovation alliance, a group of industries, which relate to China’s key strategic, have achieved a major breakthrough in cutting-edge technology. For instance, steel recycling processes alliance in the first batch has successfully developed more than 200 innovative technologies and captured a number of core technical problems in the industry. A new generation of coal (energy) Chemical Alliance develops fluidized bed methanol-to-propylene industrial technology by itself, breaking the monopoly of foreign countries. Moreover, the industrial innovation alliance established by enterprises, universities and research institutions plays an irreplaceable role in economic development. Industrial innovation alliance can reduce the R&D investment risk of participants, access to new technologies or new products, improve core competitiveness, and promote the level of industrial technology in China by the close cooperation. Therefore, based on such a positive role of industrial technology in China, the development of industrial innovation alliance is much needed.

However, the fact shows that the development process of industrial innovation alliance based on the technical exchange oriented and technological innovation oriented is very slow.

Industrial innovation alliance to promote technical exchanges and technological innovation-oriented development process is very slow. Alliance project leading enterprises lack the desire to seek joint ventures, and most companies do not have the basic capabilities to make enterprise cooperation. Meanwhile, scholars have also discovered industrial alliance problem. Ying and Hu (2011)<sup>[1]</sup> point out three issues on industrial technology strategic alliance, i.e. lack of government guidance, lack of continuous innovation, and low investment in research and development. Porter et al. (1987)<sup>[2]</sup> find that the failure rate of industrial technology strategic alliance can up to 40% to 70%, which mostly dues to the development of the instability of the industrial technology innovation strategic alliance (represented by ITISA). Bruhn (1995) proposes that the instability of industrial technology innovation alliance mainly from alliance interior, which can lead to collapse finally. Sarkar & Cullen (1995)<sup>[4]</sup> and

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Aulak (1996) <sup>[5]</sup> emphasize the importance of member selection on building industrial technology innovation alliance, and consider four critical impact on partner selection, i.e. trust, dependence of mutual benefit, set up costs, and termination costs. Su (2011) <sup>[6]</sup> proposes that mechanism innovation is essence of industrial technology innovation alliance. Arvanitis and Vonortas (2000) <sup>[7]</sup> point out that knowledge transfer and sharing are the core issue of research trends of industrial technology innovation alliance.

The paper takes Visico Alliance as an example, and analyzes six impact factors of ITISA, i.e. development status, organizational structure, mode of operation, capital investment, fund management system, situation of communication and cooperation. Moreover, the paper summers up the intrinsic theoretical reasons of technology strategic alliance, and discuss the countermeasures to promote the healthy development of the industry innovation alliance, which contributes to develop recommendations for the next step in the country's independent innovation policy rationalization proposals.

## 2 Visico Alliance Development

### 2.1 Alliance Description

Industrial technology innovation strategic alliance is a technological innovation cooperation organization in the formation of joint development, complementary advantages, benefit sharing, and risk sharing, which involves enterprises, universities, research institutions, or other organizations. ITISA is based on enterprise development needs and common interests of all parties, to serve for the protection of a legally binding contract.

Visico Alliance was founded in October 2008, which is China's first commitment to universal access to broadband networks, promotes three networks convergence, and promotes technological innovation chain of the broadband industry to build national alliance. In January 2010, the fiber access (FTTx) industry alliance was approved by the Ministry of Science and Technology, which become one of the country's first batch 36 pilot alliances. In terms of industrial development, the products sale of the alliance optical access system and fiber optic cable is a top priority in the world.

### 2.2 Alliance Objective

The alliance objectives of the Visico Alliance are implementing the national information strategy, promoting three networks convergence, developing broadband, enhancing industrial technology innovation capability and global competitiveness of China light intervention.

(1) Cooperation in technological innovation, enhancing core competitiveness of fiber access (including systems, optical fiber cable, optoelectronic devices, etc.), and achieving new breakthroughs in independent intellectual property rights of key technologies;

(2) Cooperation reference innovation, building a fiber intervention network which has international advanced level and competitiveness, and can meet Chinese characteristics and application requirements;

(3) Based on the original innovation and technical standards, striving to sustainable access to the new technology in the field of international standards for the right to speak.

### 2.3 Alliance Development and Industry Development

The total annual income of the main business of alliance member companies reaches more than 1.5 trillion RMB in 2010 and 1.3 trillion RMB in 2011, which occupies more than 90% of the information and communication business revenue. The domestic market share of the alliance in China fiber access systems equipment occupies more than 90%; the domestic market share in access to fiber optic cable occupies more than 50%, the international market share occupies 12%, and production scale ranks second in the world. The domestic market share of optoelectronic devices domestic market share occupies 40%. The low-end access optoelectronic devices do a fair amount of exporting to Europe and the United States Japan and South Korea, accounting for 40% of the annual shipments; construction and operation of fiber access networks accounted for more than 95%. Based on the demand for industrial development, the alliance members achieve a joint application to the national science and technology projects, and division of work in the process of commitments, complementing each other, and finally get what they want to achieve the effect of  $1 + 1 > 2$ .

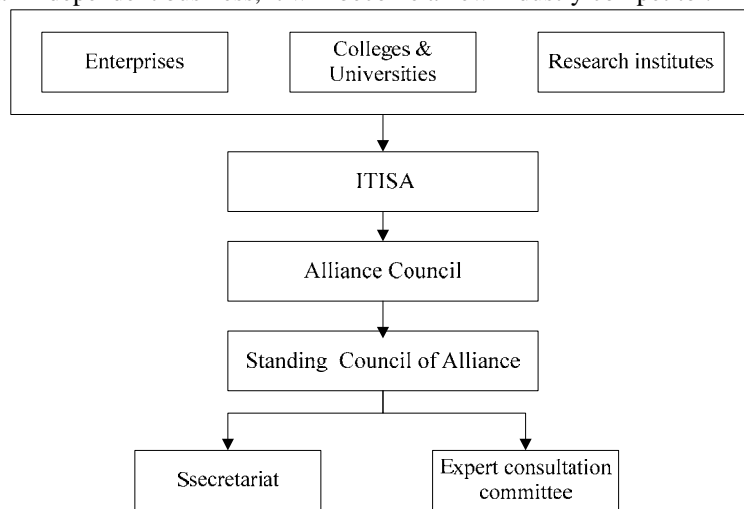
**2.4 Alliance Structure**

Currently, Visico Alliance is mainly constituted by the alliance members of the Council of the League, Alliance General Council, the Secretariat of the League, the expert Advisory Committee. The alliance members are extensive, involving businesses, universities, and research institutes, the initial formation of the "CEEUSRO" integration mechanisms.

**2.5 Alliance Mode**

The ITISA starts late in China. Though many scholars have made theoretical study on ITISA, the issue on relationship between organizational model and development needs cannot be well resolved. Currently, the main mode of the alliance is non-legal entity-type mode, which refers to no independent legal personality and no joint entity R&D institutions. The small part of the alliance adopts equity-based legal entity type mode. Some other members build alliance by forming industry technological society groups, such as TD-SCDMA alliance.

According to the 2011 summary report of each alliance, some alliances have obtained legal personality or have a mind to obtain. Once the alliance has an independent legal personality, in other words becomes an independent business, it will become a new industry competitor.



**Figure 1 Internal Organization of Visico ITISA**

The competitive situation cannot be avoided in the industry chain. The alliance internal members have tends to form a negative sum game effect. Specific value provided by the each member is difficult to measure. In the primary stage, alliance members usually cannot provide large amount of set-up funds, which may leads to large corporate equity monopoly; in the development stage, the nature and original intention of alliances may changes when they face the uncontrollable situations of equipment depreciation, insufficient R&D capability, lack of production capacity etc.

Therefore, ITISA alliance should not obtain legal personality. The alliances which have been made in the legal personality, should independent operator as a third-party service enterprise under government’s guidance and management,

**2.6 Operation Management**

The operating mechanism of Visico industrial technology strategic alliance has a complete process system, which takes advantage of expert resources, full supports research projects, and promotes technology standardization process. Based on the careful division of work and definite steps, the effectiveness of project review achieves maximized protection. Separation of the administrative work and intellectual property management avoid cross-cutting brought legal risk and moral hazard. The operating mechanism can be promoted to high-tech or metal manufacturing industries. The operating mechanism which appropriately reduces the technical standardization requirements can also be used in processing and manufacturing industry of agricultural products, and chemical products manufacturing industry. However, the project review system should be strengthened to reduce or eliminate “speculation

behavior” due to the large number of relevant alliance members.

**2.7 Internal Communication**

Based on co-ordination arrangement and differentiated technological innovation (such as GPON, EPON, WDMPON etc.), alliance members gradually influence and even lead the formulation of relevant international standards in their industries, such as ITU, IEEE, and FSN etc. under coordinately promotion of secretariat.

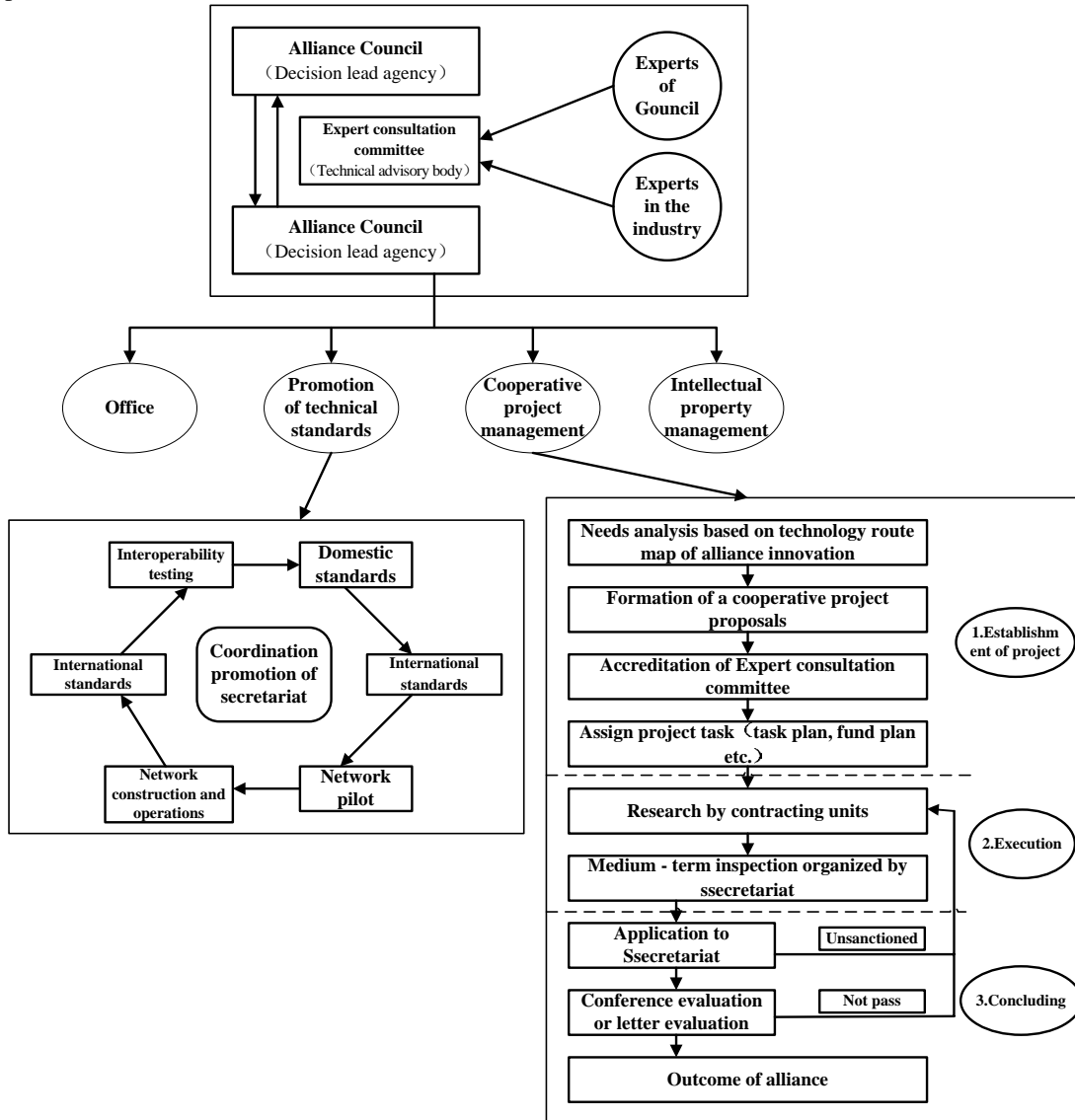


Figure 2 Operating Mechanism of Fiber Access Industry ITISA

**3 Existing Problems in Visico Alliance**

According to the research results and literature survey, the obstacles in the process of implementation of the national scientific and technological projects in Visico Alliance come from three main reasons, weak technological base, financial constraints and the slow development of the industry alliance.

**3.1 Weak foundation of technology**

The technical R & D system of Visico alliance is shown in Figure 3. Alliance members participate in the operation of the Union's decision-making; develop the strategic direction of technological innovation and long-term development plan according to their own innovation and industry needs.

Alliance members send related staff to participate in the work of innovation alliance, which can maintain a smooth communication with R&D department, and share experience in scientific research and practical results. The project's commitment has priority use rights to scientific research of industrial innovation alliance, and has part of its participation in share according to its intellectual property rights. On the outcome of proliferation issues, alliance does not open the patent usage right to non-alliance members in order to protect the interests of the alliance members.

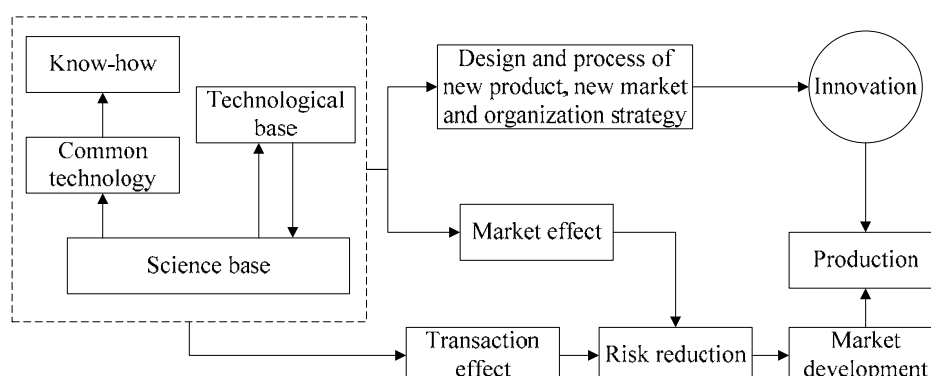


Figure 3 Industrial Technology R&D System of Visico Alliance

The problems of the Visico Alliance in low-cost, flexible application, system maintenance, are the common and critical issues to the development of large-scale fiber access, and also the issue FTTH should solve.

The main impact factors of the above issues are as follows: ①lack of critical technical capacity; ②weak conditions of equipment to R&D platform; ③drawback of research capacity and innovation capability of manufacturing process; ④industrial level is insufficient, barriers to foreign intellectual property. To breakthrough and solve those “bottlenecks” need a lot of money. However, enterprises cannot afford by themselves and national special funds are not enough, which lead to difficult development.

Alliance member FHT proposes that researchers of enterprises should participate in expert workshop of national technology research project, discuss the research issues with related experts, which can contribute to constructive projects that have more accordance with national industrial development needs, strong potential for development and taking into account the enterprise's interests.

### 3.2 Funds and its management

The main source of Visico Alliance R&D funding comes from tow aspects in the implementation of the national scientific and technological support projects: government support and the self-provided funds. The government support can only be used for the operations of particular projects, not as alliance management costs. The self-provided funds come from main investors of alliance. The expense ratio of government support to self-provided funds is 1:4 in support project, which shows the limit of government support funds. Currently, the national government provides total 37.43 million RMB in support projects, comparing 1.1 billion RMB from self-provided funds.

Alliance members show big pressure to funds operation according to the research results. If the national government cannot provide funds support to basic research projects, enterprises have to share part of funds to basic research projects, which severely restrict the development of core competitiveness of enterprises and even industrial development. For instance, as one of the members of the alliance council, FHT provides partial funding free of charge every year, in order to maintain the construction and development of the alliance.

### 3.3 Alliance and SMEs

Based on the demand for new technology development, Visico Alliance has begun to explore how to strengthen the communication and cooperation of the internal members. The countermeasures are holding regular technical exchange workshops, enterprise joint research, enterprise complementary advantages, and strategic cooperation as well. However, the countermeasures have high limitation limitations to promote communication and cooperation of alliance members. Most of the small and

medium enterprises cannot participate in high-tech research projects under the monopoly of leading enterprises, which leads to poor situation of industrial basic research in China.

Currently, a number of leading enterprises have communication with foreign large enterprises and worldwide well-known colleges and universities. For instance, BTI and FHT entered into a development and support agreement. However, small and medium enterprises do not have enough strength to such cooperation. Therefore, the result leads to “the strong stronger and the weak weaker” situation, which is detrimental to the development of the whole industry.

Moreover, the communication between alliance members and non-alliance members is seldom. Alliances have no intention to expand their scale and do not want to absorb new members. The reasons are as follows.

(1) Competition in the industry chain node. The industry chain is relatively dense in fiber industry. Once a new member is introduced, the balance within the industry chain will be broken and the competition situation will become much more complicated which goes against with alliance stability and development.

(2) Enterprise capability. The early establishment of alliance is supported by the national Ministry. Enterprise capability and scale should be considered in screening the first batch of alliance members. The enterprises, universities and academic institute with strong strength will join the alliances in the subsequent development process. Each alliance member occupies its position in the industry chain now. Therefore, the possibility of admitting new members is almost lost.

(3) The prospect of the industry. Taiwan enterprises and joint ventures form a plastic optical fiber alliance. They hope to join the fiber access ITISA in the process of alliance development but are declined by the alliance council finally. The main reason is that fiber access represents the mainstream of the worldwide fiber optic industry development trends, but plastic optical fiber is a niche industry, the potential is small for development.

#### **4 Suggestions for a Better Development of Visico Alliance**

(1) Building national fiber research center. National fiber research center should be established with the help of the National Science and Technology Ministry, focusing on the basis technology and common technology. Small and medium-sized enterprises should be paid attention to provide hardware environment of R&D. Researchers of enterprise can be invited to expert discussion workshop, which committed to high-tech R & D, clear the direction of industrial development, industrial development continued, to provide scientific advice on major issues, research, decision-making, the formation of long-term management mechanism, for the industry development provides a good environment for the development, improve the competitiveness of the industry.

(2) Fund input and support. Implement national supportive policy, enhance support strength, shorten R&D cycle, promote key project. Membership fee should be transfer into alliance in order to maintain normal operations of alliance. New alliance members should be absorbed appropriately in order to expand alliance influence and ensure implementation capacity.

(3) Enhance management system. Supervision and punishment should be strengthened aiming at nonfeasance or speculation behaviors of alliance members and project undertaking enterprises. The enterprises and research groups in key projects should be supported. Several policies, such as organization leadership, guidance of industry chain, overall plans and coordination, and supervision, should be paid important attention. Adequate and systematic service should be improved to develop alliance establishment.

(4) Encourage communication and cooperation. Communication between alliance members and non-alliance members should be encouraged in the fields of technology development trend and basis technology research. Foreign potential members can be absorbed into alliances in order to reach international technology level. Foreign talents and good research mechanism can also be introduced in order to improve their own development.

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## Study on Independent Directors of Listed Companies in China

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**Abstract:** Independent directors should be independent. They should neither occupy any position(s) other than seats on board in listed company, nor have any relationship(s) with either the listed company or its majority shareholder(s) that may adversely affect them making independent judgment and decisions. Since China employed the independent director system in listed companies in 2001, independent directors have contributed to the protection of minority shareholders' interests and the improvement of corporation government in listed companies. However, there is still a considerable gap between the reality and the goal that the independent director system is established to achieve. Through investigation and statistical analysis, this paper has found out the main problem of the independent director system in China's listed companies, which is the election mechanism of independent directors. The author pointed out that the engagement or dismissal of an independent director is controlled by majority shareholder(s) and chairman of the board or CEO who represents the majority shareholder(s)' interests. For solving the foregoing problem, this paper proposes a detailed, practical solution for the election mechanism of independent directors in listed companies, which based on excluding or restricting controlling shareholder(s) or majority shareholder(s) to nominate independent directors in order that the independent director(s) could maintain independence.

**Key words:** Corporate governance; Election mechanisms; Independent directors; Statistical Analysis

### 1 Introduction of the Independent Director System in Listed Companies in China

#### 1.1 Overview of listed companies in China and their problems

Since listed companies initially appeared on Chinese economic stage in 1991, they have made a tremendous growth in the past more than 20 years. The number of listed companies has expanded from the initial 14 to 2,432 since 1991 until to June 11, 2012. However, due to historical factors, most of listed companies in China rooted in the disposition and reorganization of the state-owned entities, and therefore they generally have the state-owned shares overwhelming characteristic, which made listed companies gain rapid expansion and meantime caused a few of outstanding problems related to the historical and institutional factors. The main problems, among others, are as below:

1) Major shareholders deprived the interests of minority shareholders. Due to asymmetric information and imbalanced shares, the major shareholders deprived interests of minority shareholders at will, and it is difficult for minority shareholders to get their interests reflected or protected.

2) "Internal control" is serious. The phenomena of "internal control" fleeing the company, major shareholders damaging the interests of minority shareholders in listed companies are very serious. The insiders are also known as the inside directors, referring to director and senior management. Senior management, referring to the company's general manager, deputy general manager, financial person in charge of listed company, board secretary and other persons stipulated by the articles of association, namely staff appointed by the Board. The results for internal control is senior management arrogate all powers, the Board of Directors remain useless, and the power structure of the company is serious imbalance.

3) Frequent related-party transactions. The related party of the listed company is usually its controlling shareholder. Due to the dominance status of the controlling shareholder, it can easily abuse the controlling power for the sake of self-interest to have illegal related-party transactions with the listed company, and therefore make some trading arrangements are not conducive to the interests of both minority shareholders and the creditors.

As a result of the above highlighted problems, crimes and delisting cases happened one after another in listed companies, which frequently raised an alarm to investors, regulators, and even listed companies themselves.

#### 1.2 Overview of independent directors in listed companies in China

In response to the problems of listed companies mentioned above, government regulators have applied a series of solutions. The most important solution is the implementation of the independent

director system in listed companies.

On August 16, 2001, the China Securities Regulatory Commission (“CSRC”) released the Guiding Opinions on the Establishment of Systems of Independent Directors by Listed Companies (hereafter referred to as the Guiding Opinions), which required that listed companies should establish Independent Director Systems. The Guiding Opinions set forth provisions on qualifications, selection, responsibilities, functions and powers, allowances, and etc. of independent directors. Meanwhile, the Guiding Opinions set time limits for fully establishing independent director systems by all listed companies in China.

On January 7, 2002, CSRC and the State Economic and Trade Commission jointly released the Code of Corporate Governance for Listed Companies in China (hereafter referred to as the Code). The Code has been the most comprehensive standards of corporate governance in China's securities market since the market opened. The Code also set out detailed provisions for establishing independent director systems by listed companies.

On January 1, 2006, the amended Company Law of the People's Republic of China (hereafter referred to as the 2006 Company Law) became effective, which had been amended and adopted at the 18<sup>th</sup> session of the Standing Committee of the 10<sup>th</sup> National People's Congress of the People's Republic of China on October 27, 2005. Article 123 of the 2006 Company Law provides that: A listed company shall have independent directors, and the concrete measures shall be formulated by the State Council. Although the provision is simple, it indicated that the system of independent director was recognized by law for the first time, and since then, the establishment of independent director systems in listed companies has been a statutory requirement in China.

According to the author's statistics, as of the end of 2011, the A shares of 2,314 listed companies have a total of 7,595 independent director positions, the total number of independent directors is up to 5,593 people. Per independent director is serving in 1.36 companies. From the sources of independent directors, university scholars are most popular and nearly 40% of independent directors are university professors and experts. Some experts pointed out that those scholars in universities have become the largest source of independent directors. That is because, on the one hand, they have relatively high quality, and are quite well-known; and on the other hand, scholars in universities are lack of corporate experience which will not offer too much opinion about specific management issues to companies. The second largest source of independent directors is financial and legal profession: 17% of the independent directors come from accounting firms and law firms, and they all enjoy high professional ability and reputation. In addition, active or retired government officials as well as the person in charge of the industry association have also become an important component of the independent directors. More than 15% of the independent directors once worked in government, and nearly 12% of the independent directors with the background of the relevant industry associations.

**Table 1 The Sources of Independent Directors**

The Sources of Independent Directors	(%)
University Scholars	40
Accounting Firms and Law Firms	17
Government Officials	15
Relevant Industry Associations	12
Consultancies	10
Others	6

## **2 Problems Existing in the Election Mechanism of the Independent Director System of Listed Companies in China**

### **2.1 Comments on the status of the elective mechanism of the independent directors of listed companies in China**

As to elective mechanism of independent directors, the current provisions are found only in the Guiding Opinions by CSRC. Article IV of the Guiding Opinions stipulates that a listed company's board of directors, supervisory board and shareholders who individually or together hold not less than 1% of the shares in the listed company may nominate candidates for Independent Director. Such directors will be decided through election by the shareholders' general meeting.



As the existence of the aforementioned dominance and internal control in corporate governance of listed companies, this elective mechanism will undoubtedly give the vote right of the independent directors to the major shareholder and the internals who actually control the board of directors. For their own sake of interests and for no obstacle when violating interests of the minority shareholders, of course, the major shareholder and the internals will choose those people to serve as independent directors who can represent the will of the major shareholder and the internals. Therefore, the elective mechanism provided by the above provision cannot guarantee the independence of the independent directors, but only led the independent directors to become the spokesmen for the interests of major shareholders.

According to the author statistics about the independent directors of 300 listed companies in 2011, the independence of independent directors is not strong, and the main reason to it is the elective mechanism of independent directors. In those listed companies by statistics, nearly 90% of independent directors are nominated by major shareholders or the board of directors, and in which 65% of independent directors are nominated by major shareholders, 24% are nominated by the board of directors, and only a very limited quantity of independent directors are nominated by minority shareholders. Status of elective mechanism of independent directors led to the independent advice from the independent directors is actually dependence.

**Table 2 Nominators of Independent Directors**

Nominators of Independent Directors	(%)
Controlling Shareholders	65
The Board of Directors	24
The Supervisory Boards	8
Non-Controlling Shareholders	2
Minority Shareholders	1

## 2.2 Problems existing in the current elective mechanism of the independent director system

The original intention of establishing independent director systems in listed companies in China is to protect the legitimate rights and interests of minority shareholders and to improve the corporate governance structure as well. However, under the current elective mechanism of independent directors, the independent director system is fallen well short of its goals. On one hand, independent directors were commonly controlled by majority shareholders and it was very hard to fulfill their duties, and on the other hand, some independent directors did not take serious about their jobs and thus were willing to do nothing. As results, there are some so-called “celebrity directors”, “vase directors”, “favor directors”, and “consultant directors”. A scholar has criticized such phenomenon in an article published in People's Daily on May 5, 2012, and pointed out that the independent director positions have become benefits for the privileged.

By counting and analyzing public Administrative Punishment Decisions issued by CSRC during the period from April 2004 to October 2009, CSRC gave 114 independent directors warning punishment, and at the meantime 36 of the 114 independent directors were also imposed a fine of RMB 30,000 or 50,000 yuan. From January 2007 to June 2009, the Shenzhen Stock Exchange has given disciplinary punishment to 89 independent directors who serve in the 29 listed companies. Among them, 69 were circularized a criticism and 20 were imposed a public censure. From July 2008 to June 2009, the Shanghai Stock Exchange has reviewed 78 cases of violations by independent directors. These further show that the current elective mechanism of independent directors make independent directors attach to the controlling shareholders or the actual controllers of listed companies, and therefore violations of laws and regulations by independent directors are very prominent.

## 3 Causes of Problems Existing in the Election Mechanism of the Independent Director System of Listed Companies in China

The author believes that the reasons for the operation problems of the independent director system include not only the working ability of independent directors, working expenses, and other aspects of reasons, but also the deeper inherent defects of the existing independent directors elected mechanism, and the long-term legal absence of independent director system.

First of all, there is a serious flaw in the current elective mechanism of independent directors.

Shares are highly concentrated in listed companies in China. Furthermore, there are quite severe “insider control” problems in those companies too. Under these circumstances, most of candidates of independent directors, in practice, were nominated by the controlling shareholders or insiders in accordance with Article 4 of the Guiding Opinions issued by CSRC, and in other words, the controlling shareholders or insiders decided who could take on the positions of independent directors in listed companies. This phenomenon is completely contrary to the duties of independent directors. This is the main reason why independent directors often badly behaved in listed companies. As mentioned earlier, independent directors are supposed to play big roles in listed companies in China. They should not only supervise the fairness of related-party transactions carried on by listed companies, but also oversee whether the insiders and senior managers of listed companies act in accordance with the companies’ interests in performing their duties. To independent directors with such a heavy burden of responsibilities, it is incredible that they are nominated and appointed by persons supervised by them. It is obvious that, under such elective mechanism, independent directors in listed companies are impossible to keep a true and complete independence.

Next, there are no regulations on the independent director system for a long time. Although the 2006 Company Law that took effect on January 1, 2006 provides that all listed companies must have independent directors, raising the level of the independent director system, that provision is very simple, and has authorized the State Council to formulate the specific measures, such as independent directors producing mechanism, functions and duties, rights and responsibilities, incentive mechanism, litigation system, etc. So far, the 2006 Company Law has come into effect for more than six years, but the State Council has not drawn up any specific rules on any aspect of the independent director system under authorization. It has been showed that the long-time absence of regulations on the independent director system in China caused the election of independent directors without institutional support.

## **4 Proposals on the Improvement of the Current Elective Mechanism of Independent Directors**

### **4.1 The theoretical basis of proposals**

For the election mechanism of independent directors, the core of maintaining vital and effective working is the Independence. The independence is essential to independent director mechanism and to ensure the independence is the foundation of its effective working. The election phase is, of course, the first step in keeping the independence. So, only by maintaining independence can independent directors step forward for the minority shareholders and fight for their interests. Considering that the ownership structure is highly centralized in our public companies, we should make sure that the election of independent directors is independent of controlling shareholders and majority shareholders. And that is the author’s aim and purpose for offering advices.

### **4.2 Detailed proposals on the election mechanism of independent directors**

In author’s opinion, the design of election mechanism is not only to maintain its independence, but also can not violate the 2006 Company Law. So, the suggested measures are as follows:

#### **4.2.1 The proportion of independent directors on the board of directors**

The number of independent directors, which has a direct bearing on the degree of dominance on shareholder’s proposal right by majority shareholders, is the basic measure to make sure the effectiveness of the independent director system. Therefore, substantially raising the proportion of independent directors on the board has realistic importance. Based on studies by OECD in 1999, the proportion of independent directors on the board was 62% in the U.S., 34% in UK, and 29% in France. In addition, according to the report published by Kom-Ferry in May, 2000, the average number of directors on the board among the Fortune 1000 was 11, and 9 of 11 are independent directors, accounting for 81.2% of the total number of directors on the board, the remaining 2 directors are insiders, accounting for 18.2%. This kind of phenomenon does not appear by accident, it is an inevitable choice for listed companies as the development of economy and the constant progress of capital markets.

The author thinks that at least half the board members of a listed company in China should be independent. In this way, independent directors can not only increase the difficulty of inside control in a listed company, but also easily develop a group size effect in order to dominate the decision-making processes of the board. This will promote the formation of a just and independent board in a listed company, and fundamentally solve the problem of insiders control in listed companies in China.

#### **4.2.2 The number of candidates for independent directors**

The author suggests that the total number of candidates for independent directors should be twice greater than the number of independent directors to be elected. Thus, the best fits could be selected, and all vacancies of independent director positions on the board could be filled as well.

#### 4.2.3 Qualifications of independent directors

Candidates for independent directors should be chosen from persons who meet the qualifications required by the job. The author proposes that the government regulators should lead to establish the independent director's qualification certification mechanism and the pool of qualified candidates for independent directors, and then candidates for independent directors in any listed company can only come from the pool. Since the author focuses on proposing about the current elective mechanism of independent directors, he will not deeply discuss the issue of qualifications of independent directors in this paper.

#### 4.2.4 The nomination of candidates for independent directors

To nominate candidates for independent directors is the first step in the election process of independent directors. This step gives the most important impact on the independence of independent directors. As one of the important goals of the establishment of the independent director system in China is to protect the rights and interests of minority shareholders, the legal design of nominating candidates for independent directors should be in favor of achieving such a goal.

As was discussed before, there exist majority or controlling shareholders and "insider control" defects in listed companies in China, such defects enable majority shareholders to dominate not only in general meeting of shareholders, but also in the board of directors and the board of supervisors. Under the current elective mechanism of independent directors, majority shareholders and their agents are able to make sure their nominees to be finally elected as independent directors through a series of procedures. This shows that the majority shareholders in a listed company in fact gain the power to select and appoint independent directors due to the current election mechanism, but such power is supposed to be held by the company. As a result, the current election mechanism of independent directors contributes nothing to keeping independent directors independence.

In conclusion, if independent directors in China want to keep their independence, they must have no relationships with the controlling or majority shareholders in listed companies. There are no current law and regulations of restricting the majority shareholders to nominate independent directors in listed companies. The author believes that the nomination of independent directors by the controlling or majority shareholders and insiders is contrary to the original intention of implementing the independent director system in listed companies, so the controlling or majority shareholders should not be allowed to nominate independent directors. More specifically, if a shareholder's voting powers as a whole are enough to appoint a non-independent director, the shareholder should be restrict to nominate independent directors. Put it in another way, candidates for independent directors in a listed company should be nominated by shareholders who are unable to nominate even one non-independent director in the same company. These shareholders can solely or jointly nominate candidates for independent directors, but each shareholder or each group of shareholders is only allowed to nominate one candidate. All these nominees will be ranked in order of the amount of voting shares held by the shareholder or the group of shareholders who has nominated him or her, and then official candidates will be chosen from the top to the bottom in the ranking and the number of them will be twice the number of independent directors to be elected.

#### 4.2.5 The application of cumulative voting system and combining with the election of non-independent directors

The author proposes that the election of independent directors should be mandatorily applicable cumulative voting system, and it should consolidate election with general directors in the same general meetings of shareholders in listed companies. A candidate for Independent Director should win a seat on the board if he or she obtains half or more of the voting rights held by shareholders present at the meeting. If one vote fails to fill all vacancies of independent directors, revote after eliminating the candidate who has received the fewest votes, and so repeatedly, until all seats of independent directors on the board were taken.

All above are the author's suggestions on improving the current elective mechanism of independent directors. The author also believes that it is a systemic and complicated process to build the independent director system. Therefore, we have to not only pay attention to the election mechanism of independent directors, but also further study motivation, exit, and other mechanisms of the independent director system in order to improve the listed corporations' governance structure in China.

## 5 Conclusions

It is the governance structure of listed corporations adopting single-pattern model under British and American legal system to set up the independent director system, the purpose of which is to introduce the supervision mechanism into the board's decision-making process. By this way, the board could do a better job monitoring the management of the company, the "insider control" problem that usually happens under the circumstance of high concentrated ownership could be avoided, and the defects of the company's administrative unitary pattern could be remedied. In listed companies in China, there exist not only "insider control", inadequate disclosure of information, misleading and inaccurate information, and other problems, but also the issue of majority shareholders damaging minority shareholders' benefit. Therefore, it has a profound practical significance to set up the independent director system in listed companies in China.

For independent directors to play full functions in listed companies, we have to make scientific improvements and innovations on the original independent director system, combining with the present corporate governance structure in China's listed companies and Chinese traditional legal culture. Since the purpose of adopting the independent director system is to solve the violation of minority shareholders' interests by majority shareholders, the reform and perfection of the election mechanism of independent directors is the most urgent work to do. Specifically, for keeping independent directors independence, majority or controlling shareholders' rights to nominate independent directors in listed companies must be restricted, the cumulative voting system should be applied in the election of independent directors, and as well both independent directors and general directors should be elected at the same time. Of course, the corporate governance system of China's listed companies is a structural reform effort, a complicated and systemic project, and not just an isolated institutional reform. In short, we have to not only concern on the election mechanism of independent directors, and but also dig deeper in motivation, dismissal and other aspects of the independent director system.

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# Research on Employee Motivation Mechanism in Modern Enterprises Based on Victor H·Vroom's Expectancy Theory

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**Abstract:** The method links the theory research and the practice analyse is used in this article. It is pointed out that effective employee motivation mechanism should be performed with the guidance of proper motivation theories. The article describes the significance of Victor H Vroom's expectancy theory and the principle of using expectancy theory to establish the system of theory and methodology for personnel motivation mechanism, so as to motivate personnel of modern enterprises, and try to build motivation mechanism for the personnel of modern enterprises. It is advanced that the key of the problem is to seek measures to inspire the initiative of the employees and which is also be concerned by the ideological and political works in enterprises.

**Keywords:** Expectancy theory; Personnel motivation system; Modern enterprises

Following the development of science and technology and economy, along with building and perfecting modern enterprises system of our country, the ideological work in modern enterprises slowly meets many new opportunities and challenges. It is very important to start research on personnel motivation mechanism in modern enterprises, so as to strengthen and improve employees' political working behavior, and welcome these new opportunities and challenges.

Motivation, a key term in management psychology, means that manager uses the proper method to encourage an individual worker's behavior and passion towards his/her job and make sure the individual worker reaches and keeps an active level during his/work. Motivation mechanism is an internal system to stimulate motivation, encourage behavior, and arouse the enthusiasm to reach or keep people active. The introduction, establishment and perfection of motivation mechanism is rather important to use the advantage of ideological work, strengthen the management in modern enterprise, enhance employee's quality and practice strategies of invigorating our country through science and education.

## 1 Introduction

In the 1980's, there are four famous writings in which the theory of the foreign enterprise culture management was signed to come into being. They are "the theory of Z" written by William Ouchi, "the art of management in Japanese enterprise" written by Pascale R. theory, J., and Athos, A. G., "the culture of enterprise" written by Allan A. Kennedy and Terrence E. Deal, "the pursuit of excellence" written by Thomas Peters and Robert H. Waterman. These four books are called "four quartets" in enterprises cultural management theory. The first period in which scholars do research on the theory of enterprise culture management is also In the 1980's. It was deemed by Chen Bin fu in Nankai that the extensive attention and research on the organization culture and enterprise culture begin at the 80's, it is the new trend of the development of management science. we are told that the spirit of management is more important than the specific means of management and management method. It was pointed out by Zhang De in Tsinghua University that a lot of enterprises have devote themselves to the construction of enterprise culture when they were deepening the reform of enterprises, they have achieved the initial effect. It was pointed out by Han Xiulan in Chinese Academy of Social Sciences that every enterprise should strengthen the construction of company culture which advocate people-oriented idea when they are in strict scientific management process in accordance with modern production needs.

We can understand that the scholars all are make great efforts to pursue a proper method to agglomerate the will of the employees. So they advocate the enterprises cultural management theory. But we should know that the key of the problem is to seek measures to inspire the initiative of the employees.

## 2 Use Expectancy Theory to Build Personnel Motivation System in Modern enterprise

Effective employee motivation mechanism should be performed with the use and guidance by proper incentive theories. Those driving theories, such as *The Need Hierarchy theory* of Maslow, *ERG*

*theory of Alderfer, Achievement Incentive theory of McClelland, Dual Factors Theory of Herzberg, Adams's fair theory, Field Dynamic Theory by Lewin* are all useful to formulate our policies. Among all these theories, the expectancy theory, which is created by the brilliant psychologist and behavioral scientist Victor H Vroom, is much better to reflect the reality of our society. This theory is to encourage the motivation of employees in modern firms. The Victor H Vroom's expectancy theory can be formulated by the following function:

$$M = V * E$$

From above function, M represents inspiration, a power to encourage individual motivation and potential. V represents target potency. It means the degree of individual tendency. When individual considers the target value is minor important, the value of potency is equal zero. On the other hand, the value of potency is negative while the individual regards the target value as disadvantageous. There is no inspiration from above two consequences. E represents expecting ratio. The expecting ratio is a probability given by specific experiment. This is a probability judged by previous experiences and can be reached to the target value.

According to the expectancy theory, the intensity of the behavior tendency is determined by individual expectation and the attractiveness of the result. To be more specific, when individual worker believes that the excellent appraisal performance can be reached through personal endeavor, he/ she will dedicate to his/her job. The excellent appraisal performance evaluation brings benefit, such as bonus, raising salary and promotion to the individual worker. As a result, employees are satisfied by the incentive premium. The theory focus on three aspects as following:

Endeavor. The relationship between hard working and appraisal performance is the first aspect. The scientific appraisal performance system is crucial in determining whether a person's endeavor is effective in his/her work. A proper appraisal performance system promotes a person's value to a good level. In a word, the person's endeavor reflects the appraisal performance.

Appraisal performance and premium relationship is another aspect. The degree of incentive premium is related to the level of appraisal performance. If the individual worker believes that the excellent appraisal performance evaluation will bring rewards to his/her job, the relationship between appraisal performance and premium is strong and vice versa.

Premium and personal objective relationship represents the level of satisfaction from individual worker and the attractiveness of the rewards. If the reward is the expecting premium of individual worker, the relationship between premium and personal objective is strong and vice versa. It is crystal clear from analysis above that if the three relationships are close related to each other, the level of incentive can be reached to the maximum. In other words, the level of incentive can be best effective if the three relationships reach to the same level.

The expectancy theory of Victor H. Vroom is highly recognized by our society. It is demonstrated that if the expecting ratio is equal zero or negative, there is no need to encourage individual worker to fulfill his/her objective. The motivation mechanism depends on the target potency and expecting ratio. It is possible that the motivation to complete one task is related to the expectation to other tasks.

### **3 The Methods to Build the Employee Motivation Mechanism by Using the Expectancy Theory for Modern Enterprises**

The basic concept of using expectancy theory to encourage employee of modern enterprise is that employees can get rewards such as bonus, giving honor and satisfying their needs by following enterprise's rules and regulations and also obeying enterprise's arrangement. There are four steps which are personal endeavor, achievement, reward and satisfaction included in the concept. Meanwhile, there are following methods to encourage employees in modern enterprise:

#### **3.1 Expected incentive and Objective incentive.**

We can see from the relationship between endeavor and appraisal performance in Vroom's expectancy theory is that the motivation to achieve success in their jobs is the main reason for employees in modern enterprise. They are always willing to dedicate themselves to reach success in their jobs. If employees think their target is difficult to reach and they will not get excellent performance in their jobs. As the result, they will loss their motivation to achieve success. Therefore, the management should make use of expected motivation mechanism and objective motivation mechanism properly and control the probability to achieve the best result. It is also their responsibility to guide employees to set their goal and pursue it.

#### **3.2 Intelligence incentive and competency incentive.**

The world has changed quickly through information, digital and internet technology. There is a common problem that the modern employees are faced with inappropriate construction of knowledge structure and their learning concept is out of date. Therefore, when they expose to the continuing increased competition of job market, they have a strong intention to improve their personal value by keep learning. The modern companies, as a platform for employees, should support their motivation to improve competency. It is better to satisfy employees' objective value and inspire them to compete in the market. The enterprise should also eliminate the stress and negative thinking for employees and create working environment and conditions which can explore their potential and benefit for their future development. At the same time, the enterprise should increase its expectancy to support employees' objective value, guide their direction according to their special needs and to enhance their moral cultivation and mental and physical health.

### **3.3 Spirit reward and material reward.**

The relationship between appraisal performance and rewards in V room's expectancy theory has clearly demonstrated that the employees in modern enterprise are willing to get rewards from their achievement. The reward is combined with material rewards and spirit rewards. If the employee thinks about the rewards after him/her engaging good performance, he/she will have passion to do his/her job. On the other hand, he/she will lose enthusiasm to do the job when nothing is rewarded. Individuals also have special needs for self-approval and honor. The enterprise should give honor to the employees who have excellent performance in their jobs. Offering them spirit reward and material reward is essential to encourage other employees in order to achieve the target for the enterprise. Certainly, the proper penalty is also a way to motive employees. If employees misbehave themselves in their work, it is a good way to teach them by giving penalty. However, the reward and penalty should provide in time and properly in order to maximize the effect of motivation mechanism. Moreover, it is also important to encourage the team reward for the enterprise to cultivate group honor and team spirit.

### **3.4 Behavior incentive and model incentive.**

The elite of V room's theory are that the model employees who have excellent performance in the job, have power to inspire other employees to behave well in their jobs. The management and the model employees should influence other employees by their knowledge, moral conduct and remarks. Meanwhile, they should care about the employees and try to help them out. A powerful incentive is to inspire employee inside from their heart. Model incentive is a concrete behavior model. The model employees must be the individual or group workers who have accepted reward from the enterprise. The model is an important role in the enterprise. It teaches employees what to do and how to work on it. The model changes the enterprise's objective into a real job and improves enterprise's efficiency.

## **4 The Principle to Use Expectancy Theory to Establish Individual Incentive Policies for Modern Companies**

### **4.1 Innovation for incentive policies.**

Once the enterprise has established its incentive policies, it is important to implement without any discount so as to keep the credibility. However, meeting with the new trend and characteristics of the society, the motivation mechanism should be altered based on the employee's special needs. In order to keep the balance of motivation mechanism, the enterprise should continuously adjust the policy content.

### **4.2 The motivation mechanism should be well targeted.**

V Room's expectancy theory has demonstrated that people always wish to get reward to stratify their special needs. However, there is a difference among individual workers. As the change of time and space, the individual worker has changed their needs and level of satisfaction. Therefore, the motivation mechanism should be well targeted in different stage and different needs for individual workers. The enterprise should implement effective strategies to maximize the objective value under different situations. If the management do not treat it seriously and never analyze the situation for the enterprise, there will be no effective consequence for the incentive policies and even result in an opposite effect.

### **4.3 Motivation mechanism should be fair and appropriate.**

Professor J.S Adams in University of North Colorado of the United States introduced Equity Theory according to the unbalanced recognition theory. According to his theory, the individual not only care about his/her income and expenditure, but also care about the relationship between personal and group income and expenditure. The motivation also effects by either absolute value and relative value, that is, the incentive depends on what he gets from the reward and what other people get from the reward.

Only the proper reward and punishment can motivate employee's enthusiasm toward their jobs.

Over reward can make employees satisfied and arrogant, as a result, they lose the intention to improve themselves. Under rewards also can not reach incentive effect and make employees feel less important in their jobs. The significant principle of motivation mechanism for employees in modern enterprise is to treat employees fair, equal and open. Any unfair treatment can lead employees lose their efficiency and emotion for the job. The reward offered to employees who have achieved the same level of performance should award in the same level. Similarly, the same penalty should give to the employees who have made the same mistakes. Otherwise, the motivation mechanism will not work well among different employees. Sometimes, it can result conflict among them.

To treat employees equally must avoid average allocation. The average allocation of reward means nothing for the employees. The individual worker will compare his reward with other person and even compare with the historical reward and social reward. It is often appears that some management never treat problems from enterprise's view, they only think about the personal situations. Therefore, it would destroy many employees' enthusiasm. Indeed, equity is a feeling that every employee can feel about it. The individuals are always focusing on their own benefit, so the management should have an acute judgment based on their difference and make sure individuals keep their enthusiasm.

#### **4.4 Introduce different motivation mechanism for different employees and provide various incentive target and work target.**

According to the psychological principle, only the unsatisfied needs can trigger individual's motivation and effect individual's behaviour. The difference of individual can cause different needs at different time, even the same person has different needs at different situations. Therefore, the motivation mechanism should be changed based on the different needs. In order to satisfy their needs and inspire their motivation, the incentive target should be changed among different situations. According to the psychological theory, the motivation of employee is also influenced by the work targets which are employee's capability, environment condition, and personal relationship. The following reason causes employees have less incentive in their job, such as improper work target, incompetency and over established target. If employees have less competency and they are worked under unfavourable environment and human relations, they can also have negative attitude toward their job. Therefore, when establishing the motivation mechanism for modern companies, the management should consider employees' competency, working conditions and the relationship among workers. The motivation mechanism which has various incentive targets and adjust to different persons can maximize the enthusiasm for employees.

#### **4.5 To prevent inability to implement incentive policies.**

Firstly, the management should avoid high demand with low ability. The management and entrepreneurs must give attention to the establishment of motivation mechanism and focus on the research and implementation. Otherwise, they will lose many opportunities to reach the incentive effect. Secondly, the enterprise should avoid over burden of strategies. The motivation mechanism is well-meaning to the enterprise, but if the enterprise can not manage it well according to different situations, it does not take much to become either incentive or anger. The policy could result in an opposite consequence. Thirdly, the enterprise should prevent from prejudice. The implementation of incentive strategy is not only the responsibility of enterprise's leader, but also the responsibility of every management of the enterprise. It is better to build up the incentive motivation for every manager of the enterprise in order to create a desirable environment and reach the real target of inspiring people.

## **5 Conclusion**

It should be minded by The ideological and political works in enterprises to establish the system of theory and methodology for personnel motivation mechanism. At the same time we should remember that the ideological and political works in enterprises is the important means to improve and perfect the enterprise management.

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# An Analysis of the Gender Gap in Science, Technology and Innovation Fields in Japan

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**Abstract:** As the companies, organizations, and society are globalized, human diversity in ages, sexes, nationalities would be much more important in product, process and service innovation. Especially, how to utilize the ability of women would be a pivotal strategy to promote innovation. But in very few countries, women could work properly and there are many actions should be taken to improve those conditions. In Japan, women's working condition is worse than that of Europe and North America. This article presents analysis of the Japanese women's matters in work focusing on the fields related to science, technology and innovation. Finally, this paper will propose ideas and actions on how to ease the gender gaps in the fields.

**Key words:** Gender gap; science; Technology and innovation; Diversity; Women's matter; Positive action

## 1 Introduction

Japan's Equal Employment Opportunity Law was enacted in 1985. Since then, it seems many women have more chance to get jobs, but the ratio of working women has been growing very slowly and working condition has not been improved as much as expected. Then, the Basic Law for a gender-equal society was enacted 1999. In 2003, the headquarter for the Promotion of Gender equality set a target number, 30 percent as a women's proportion in leadership positions in all sectors of society. However, concrete steps for improving a gender gap have not been made yet so that after 27 years from the first law enacted, progress is very slow. Still now, women's participation in policy decision-making processes is not sufficient in many areas including political, administrative, economic, or academic ones. The third Basic Plan for Gender Equality tackles to promote "positive action" as an effective approach in 2011.<sup>[1]</sup>

The sixth annual World Economic Forum Global Gender Gap Report 2011 shows Japan's gender gap ranking is 98<sup>th</sup> among 135 countries in the world, the 38<sup>th</sup> among 45 high income countries.<sup>[2]</sup> In 21<sup>st</sup> century, as the world has been globalized, human diversity in ages, sexes, nationalities would play a pivotal role to industry and society. To utilized diversity produce various values that would contribute to activate organizations and society. Moreover, many technology issues confronting society and working for technology field is increasing and getting important and responsible than ever. In this field as well, the needs for women's participation are increasing and women should be empowered to contribute to it. However, Women in science, technology and innovation fields remain minority. In these fields, educational facilities should produce many talented women to support the society and work in this area. This article will investigate the current situations and problems of working conditions on Japanese women, focusing on science, technology, and innovation fields. Materials used for analysis are government's statistics, white papers, related report and surveys, journals, and discussion on the related committees.

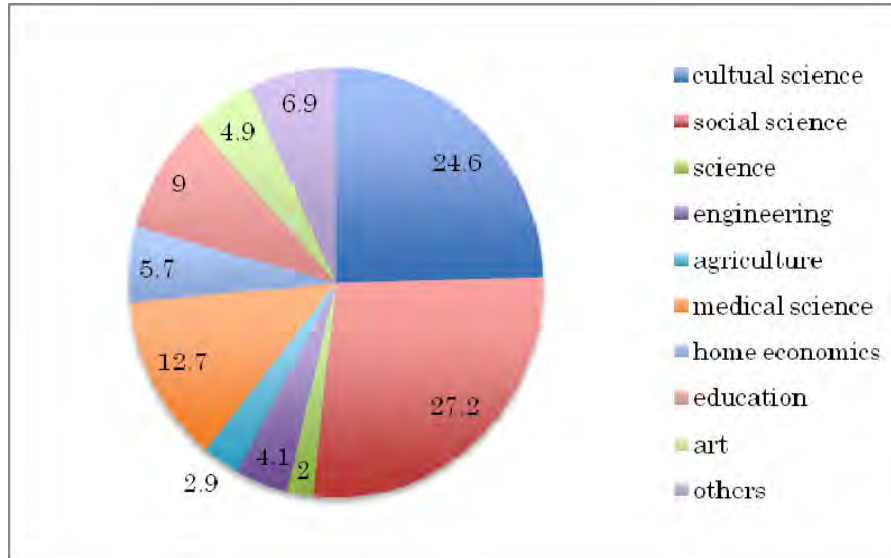
## 2 Present Situation and Problems

### 2.1 Quantity of female in science, technology field

56.0% of men and 45.8 percent women go to universities. (undergraduate) Men is 10 points higher than women. Women, however, 10.4 percent of the total go on to 2-year junior college. (undergraduate) When the rate of advancement to this junior college is combined, women's enrollment rate will be 56.2 percent. In recent years, the trend for women to go to universities (undergraduate) has risen and the percentage of women to go to junior college peaked 24.9 percent in fiscal 2006, and the rate continues to decrease since then.

Figure 1 shows that the rate of female undergraduate students who belongs to cultural science or social science exceeds 50 percent. Students that belong to science, engineering, or agricultural department are very small number, 2.0 percent, 4.1 percent, 2.9 percent, consecutively. Among science

and technology related departments, a department of medicine including medical science, public health, pharmaceuticals, dentistry, or nursing is more popular among female students than other departments.



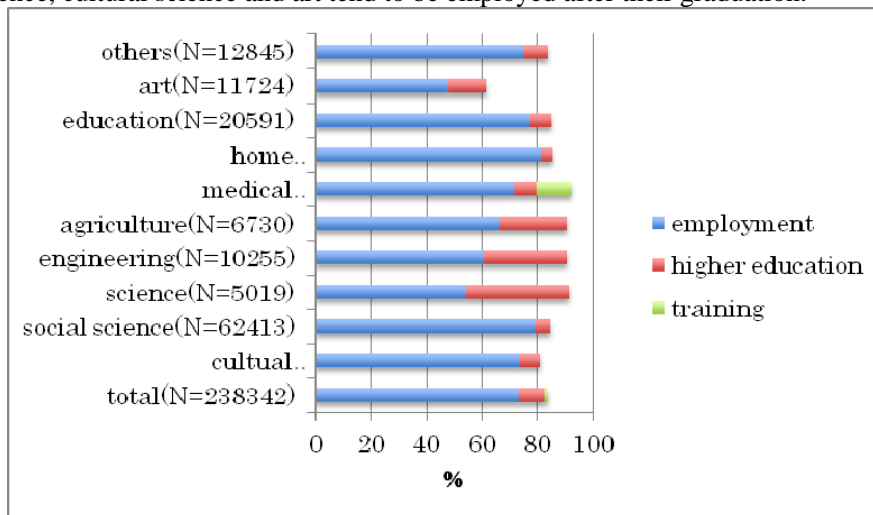
**Figure 1 Percentage of Female Students at Each Department in Undergraduate**  
 source: the Ministry of Education, Culture, Sports, Science and Technology 2009

Figure 2 shows female employment rate after students graduate each department of undergraduate school. In every department except the art department, more than 80 percent of students go to work, higher educational facilities, or trainings.

In science, engineering, and agriculture departments, students tend to go to higher education such as graduate schools rather than working. These departments have low percentage of female students than other departments as Figure one shows.

In a medical department, students tend to go to work or training for work in medical facilities. The training is obligated to work for some medical area.

The undergraduate students majoring non science and technology fields including education, social science, cultural science and art tend to be employed after their graduation.



**Figure 2 Female Employment Rate of Each Department in Undergraduate**  
 source: the Ministry of Education, Culture, Sports, Science and Technology 2009

Table 1 shows sciences or arts majored Men's or Women's differing views on important factors in choosing the major, department, and university. The most notable difference between women majoring

sciences and arts is to obtain qualifications and licenses. It would tell that the percentage of majoring medical department is higher than other department. The second significant difference is about tuitions. Departments of sciences tend to higher tuition fees than liberal arts department. And private universities have higher tuition fees than national university have.

The third one is whether there is a graduate school or not. So women in science need higher education and expertise. Given that the women majoring liberal arts regard commuting from home, good school spirit or good atmosphere in campus, or tradition and recognition of a school as important, it can be seen that women in non-science seek general education, while women in science emphasize expertise.

**Table 1 Sciences or Arts Majored Men's or Women's Differing Views on Important Factors in Choosing the Major, Department, and University**

○○ ○○	female		Male	
	arts	sciences	arts	sciences
There is a field of study that you want to major in	82.1	86.2	71.5	< 79.3
Matching subjects of the entrance exam and selection method	62.8	60.2	61.7	○○ 60.8
Matching the difficulty of Admissions	56	○○ 58.2	63.6	○○ 64.1
possibility of commuting from home	53.9	>> 43.2	42	> 35.3
Qualifications and license can be taken	39.1	<< 58.4	29.1	○○ 29.4
good school spirit or good atmosphere in campus	49.6	>> 33.6	40.2	>> 26.6
tradition and recognition of a school	44.7	>> 27.9	46.4	> 36.5
reasonable tuition	29.3	< 37.8	27.2	<< 39.7
good facilities and equipment	31	○○ 30	28.4	○○ 32
Universities not colleges	22.6	○○ 24	26.8	○○ 29.2
good supports for finding jobs	21.2	○○ 17.6	18.8	○○ 14.7
Away from parents	12.6	○○ 14.8	20.5	○○ 22.6
Located in the metropolitan	16.7	> 9.1	21.7	> 16.3
Graduate schools have been established	5.8	< 12.4	4.9	<< 23.1
There are excellent teachers and the famous teachers	9.3	○○ 6.8	9.4	○○ 9.6
There are clubs and societies you want to enter	6.3	○○ 5.7	9.4	○○ 7.7
substantia scholarships	5.2	○○ 4.5	4.9	○○ 4.8

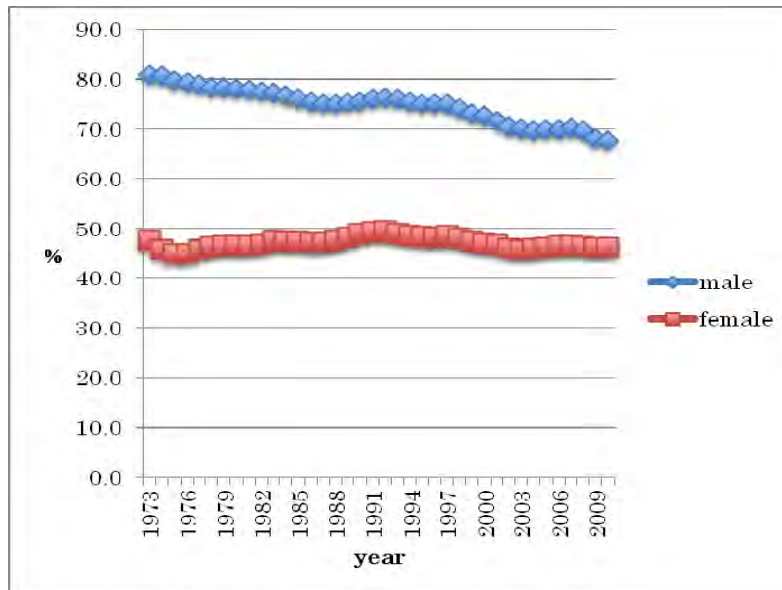
\* Multiple responses allowed

\* > or indicates < not more than 5 points difference, >> or << indicates not more than 5 points difference

Source: Ministry of Economy, Trade and Industry 2005 "Survey Report on the course selection" p125

In terms of the employment rate of women, the Figure 3 shows that female employment rate keep constant number for long years while male's employment rate are gradually decreasing year by year. After 1985, when Japan's Equal Employment Opportunity Law was enacted, the female employment rate increased a little but soon after shifted to constant level. Some of the factors of male's decreasing are decrease in population and aging society which declines working population. Moreover, while the employer is reduced in the manufacturing sector and the construction industry, increased employment in the field of medical and welfare where women's employment tends to work. These changes of the industrial structure would effects on increasing of employment.

Some other factors, though some of them are negative ones, help increasing of women's employment rate. The aging society with a low birthrate decreases the total number of labor force, so women could get more chance to work than before. . . The possibilities for women to come back to job in a long life is increasing, too. Unfortunate economic problems also force women to work. Moreover, because of low wedge of labor, one family needs double income.



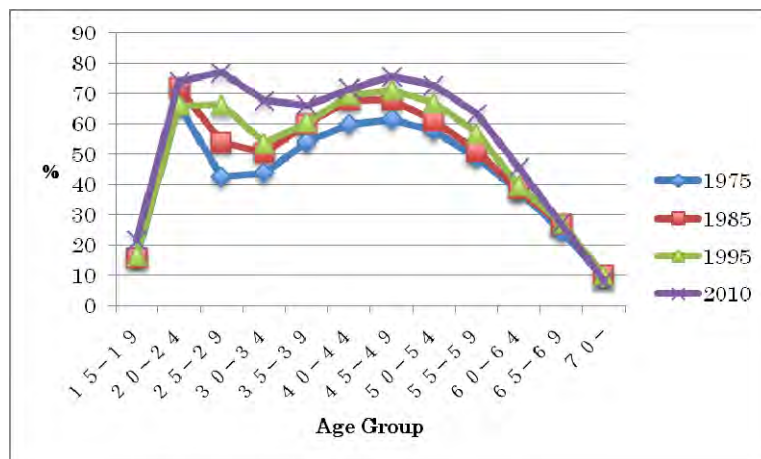
**Figure 3 Employment Rate in Japan**

Source: Statistics Bureau, Ministry of Internal Affairs and Communication

The Figure 4 shows female labor force participation rate by age group in Japan. M-shaped curve indicates that women leave jobs when they get married, give birth, or raise children and come back to labor force after children grow up. Women’s working ratio still shows M-shape curve in 2010 which is not be seen in the U.S. Sweden, or Germany, even though its incline became gentler. The peak of labor force participation rate shifted from age group 20-24 to 25-29 because the people tend to get married late recently.

In age group 40-45, the ratio of employment is as high as the peak when they return to work. However, a quality of role is different as before. Sometimes, it is difficult to find same level of job. When a woman return the same company, she falls behind to colleagues in climbing up the career ladder.<sup>[3]</sup> Women sometimes find more junior job to give them a balanced life. Proportion of non-regular workers of employed women is more than half so that the level of salaries of the women’s workers is about 70 percent of the men’s workers.<sup>[4]</sup>

In science, technology and engineering sector, especially in advanced technology sector, the fact that knowledge moves on so quickly makes it difficult for female workers to return after an extended carrier brake.<sup>[5]</sup>



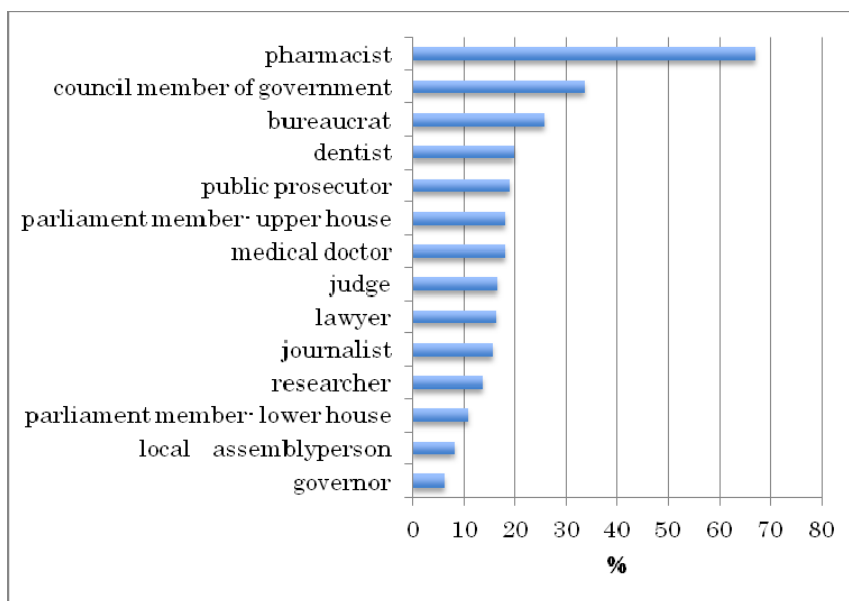
**Figure 4 Female Labor Force Participation Rate by Age Group in Japan**

Source: Statistics Bureau, Ministry of Internal Affairs and Communication 2011

### 2.3 Quality of female in science, technology field

As Figure 5 shows, in highly specialized occupations or leadership position of occupations, women’s ratio is not so high in Japan. A pharmacist is the highest percentage in the occupation, followed by dentists, medical doctors in science and technology fields. In universities, people should finish 6-year course to graduate a medical school. These three occupations need national licenses in order to practice and people should pass a national examination after graduation.

33.2 percent of members of councils is female. This figure is the second largest in the proportion of women in leadership positions. When the target number was designated in 2003 as 30 percent of women should be in leadership positions in all sectors by the headquarter for the Promotion of Gender Equality, the gender equal bureau set the quota as 30 percent for female percentage of members of the council of government. This quota would be the one of the factors of higher figure compared with others.



**Figure 5 Women's Ratio in Each Occupation**  
source: White paper 2010 Cabinet Office

Women’s serving period tend to prolonged in 2011, the ratio of more than 10 years of women’s service period account for approximately one-third of female labour. In leadership positions, As Table 2 shows, serving periods of women tend to be shorter than men’s one. In a medical sector, the percentage of female employment is high as I said above, but still the serving period is not so long. Although 6-year programs in universities and license should be taken in order to practice as pharmacists, dentists, and medical doctors, serving period is not long enough.

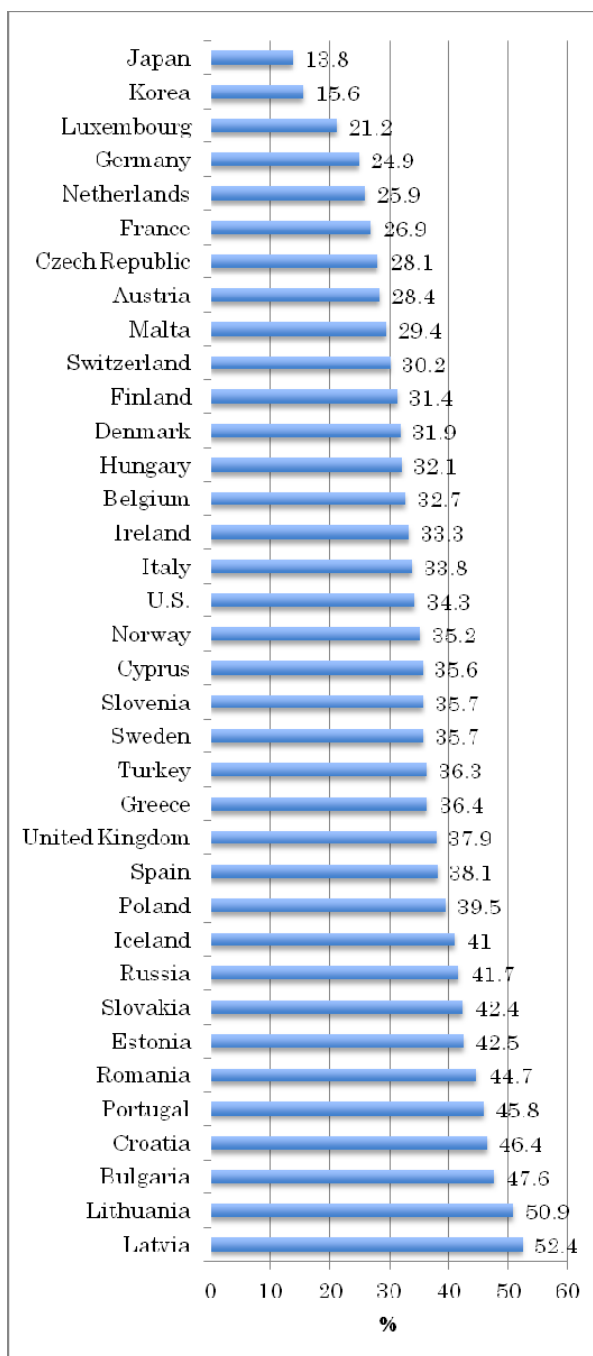
**Table 2 Serving Periods of Female And Male**

Occupation	Female	Male	difference
cabin attendant	10.1	2.5	-7.6
Lawyer	8.5	6.2	-2.3
Pharmacist	6.9	8.1	1.2
Dentist	4.6	5.8	1.2
Researcher	9.2	10.5	1.3
medical doctor	3.8	5.5	1.7
Journalist	9.4	13.7	4.3

Source: Basic Survey on Wage Structure, Health, Labour and Welfare Statistics 2009

The percentage of the researchers is growing year by year but the number of the female representatives is still small, 13.8 percent compared with 87.2 percent for male researchers. Japan’s

percentage of female researchers is the smallest among the countries in Europe and America as Figure 6 shows. The percentage of Korean researchers exceeded Japan in 2009.



**Figure 6 International Comparison on Percentage of Female Researchers**  
**Source: Cabinet Office, White Paper On Gender Equality 2011, p115**

\*The value of EU countries was created from EU “Eurostat” and includes the estimated value and the provisional value. The data of Slovakia, Russia, Czech are as of the year 2010. Switzerland, South Korea are 2008. Greece is 2005. Other countries are as of the year 2009.

\*Japanese figures are based on the “Report on the Survey of Research and Development in 2011,” the Ministry of Internal Affairs and Communications. March 31, 2011.

A figure in the United States is on the basis of "Science and Engineering Indicators 2006" of the National Science Foundation including a part of the humanities and social sciences researchers. A figure is as of the year 2003.

The large-scale survey on gender equality in science and technology professionals by Liaison Committee for Academic Society of Gender Equality shows the reasons why there is fewer female researchers. One reason is the difficulty in balancing working and family care, and second one is difficulty in returning after a period of childcare. Third one is that consideration for childcare and elderly nursing care<sup>is lacking.[6]</sup> Recently, some policy has been incorporated to solve childcare and elderly nursing. For examples, Grants in Aid for Scientific Research provides special funds for the person who returns after carrier break for having children or child care. National Universities offers family leave. The other reason is that evaluators tend to give priority to male researchers. These working conditions should be improved. The proportion of women in higher education stage is 42.6 percent in undergraduate, 29.5 percent in graduate school for master degree, and 32.7 percent in graduate school for Ph.D. Taking these numbers in to account, a higher percentage of female researchers could work for in future if working conditions are arranged.

About the affiliation of researchers, 60 percent of the male researchers belong to the companies while 30 percent belong to the universities. As for female researchers, about 60 percent belong to the universities while around 30 percent belong to the companies.<sup>[7]</sup> In universities and other research institutions where a substantial portion of female researchers belongs to, about 50 percent of the researchers is female in the fields such as Nursing and Pharmacy. On the other hand, in the field of engineering women account for only 8.8 percent and even in agriculture or science sectors, only 10 percent of the researchers is female. This number is related to the proportion of the students in Universities. There is a possibility to increase the percentage of women researchers in Universities, if the number of the students in universities, which is a parent set of future researchers, increases.

Even in the research fields where relatively high proportion of women researchers work for, probabilities are consistently getting lower against women climbing higher as lecturer, associate professor, and professor in the carrier ladder.<sup>[8]</sup>

Some government agencies are promoting science technology policies for women. The 4<sup>th</sup> basic plan for Science technology indicates that the target number of employment of female researchers should be 30 percent which is higher than the number set in the 3<sup>rd</sup> basic plan for Science and technology. The plan supports for arranging the research system for women to compatible with research and delivery or child care by incorporating flex-time, stay home work and a new personnel evaluation system. Council for Science and Technology Policy, Cabinet Office eases an age restriction for women to obtain a competitive fund. Science Council of Japan promotes female researchers to join decision making process in science and technology.

Japan Science and Technology Agency designated the programs to encourage high school female students to go to Universities and major science. It holds temporary science laboratories, guidance consulting, and networking events at high schools.

### 3 Conclusions, Implications and Actions

The analysis suggested that the improving employment and education circumstances of women are important for women sector in japan as well as for women sector in science. Many problems still exist in other sectors, too. The analysis suggested following implications and actions.

Returning to jobs is difficult for women after they leave a company when they have children or have commitment with families. Once women leave occupation, it is hard to return to the same level of work. By utilizing parental leave and child care facilities, women should keep occupations . As a positive action, this facilities and laws should be arranged. To advise women to stay jobs and support them to return to work is important as well.

Licenses and qualifications help women's work. The percentage of leader's position of women with licenses and qualifications is relatively high , especially in a medical field including pharmaceuticals, medical doctors, and dentists. However, their serving period is not so long in spite of their long studying period. This tendency should be reformed by supporting work conditions.

- Establish a mentoring system for women in science technology and innovation field. Because there is a possibility that the image of the profession and fixed idea of gender roles in society has affected the course selection, educational opportunities and providing information about career choices to wide range of women is important.

Staying on jobs or prolonged service period of female work are very important. Indicating some roll models that show women's carrier paths and some mentoring system for women help these problems.

Organize some symposia in order to do guidance counseling and carrier building counseling for women in science in high schools and universities. Mentor high school students, university students to give them right information.

Discuss top managements of companies on women's matter in order to obtain their commitment.

- Send out questionnaire to top managements to investigate the current situation. Survey to know the current situation is very important and statistical number is effective to know the present state.

To legislate or amend bills to support empowerment of women is essential. For examples, family leave, parental leave, childcare facilities, tax incentives should be incorporated properly.

Quota system among positive actions sometimes propels the targeted number as the proportion of members of government council shows. Government sectors should utilize it.

In future, I am planning to do interviews to advance countries abroad in gender equal policy to determine the causes of the difference from Japan. However, characteristics of Gender gaps and countermeasures often depend on the country's culture, customs, and political philosophy. Incorporating ideas from other countries, it is important to have country-specific approach to solve the problems.

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# Research on Rural Human Resources Development in Hunan Province under the Rising Strategy of Central China\*

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**Abstract:** This article uses the comprehensive analysis way to put forward that Hunan Province shall greatly develop and utilize rural human resources to satisfy the urgent demands of new rural construction. On the research's opinion, the most importance of developing and utilizing human resources is the establishment of rural evaluation index system. Therefore, it systematically forges rural human resources developing evaluation index system in Hunan Province and puts forward greater controllable strategies and measurements based on this.

**Key Words:** Rise of central China; Human resources development; Rural science and technology Co-operation

## 1 Introduction

Throughout the world, the developed countries are taking a lead in human resources development and utilization in theoretically and practically, and among them, America, Germany, Japan and Korea are more representative with different characteristics. In 1995, Robert Lucas, the winner of Nobel Economic Prize, pointed out that efficiency benefits would be increased as the accumulation of human resources. Currently, there are more relevant researches on human resources area, but there is not so much academic achievements involving in rural human resources development, especially based on Hunan Province and systematically studying this issue from the point of view of economics and sociology. The topic of this paper is taking this as the basic starting point.

## 2 The Important Meaning of Rural Human Resources Development in Hunan under The Rising Strategy of Central China

Central China plays an important role in overall economic society development in our country and makes great contribution to economic society development in the whole country for a long time.<sup>[1]</sup> In the six provinces of Central China, no matter the geographic location, historical culture, or educational tradition, Hunan has the insurmountable potential compared with other provinces or cities, and it should be the top priority of the strategy of Central China. The realization of the rising strategy of Central China is to firstly settle the Three Rural Issues. As the major agricultural province, Hunan plays an extremely important role in the whole country and the Central China, and the Three Rural Issues in Hunan are the most outstanding one.<sup>[2]</sup> The peasants account for 70% of the 68 million persons in Hunan, and the rural labor force resources in the labor age level are 35 million persons, which can show that the rural human resources in Hunan is very rich, but the proportion is strictly imbalanced, as well as the low-effective use or set-aside of general labor force and the extremely lack of high-qualified labor force is specially outstanding. The key of the Three Rural Issues is the agricultural industrialization and peasants' income problem. Basically speaking, there ultimately needs to effectively develop and utilize the rural human resources of our province to settle the Three Rural Issues in Hunan.<sup>[3]</sup>

### 2.1 Develop the rural resources of our province and change the peasants' ignorant and outdated ideas

Hunan has a long history, which is one of the cradles of Chinese civilization, and at the same time, the feudal thought in the countryside is also deep-rooted. Compared with the coastal and eastern developed area, the ideology of unproductive, setting for less, and lockstep is very serious, which ties up the pace and speed of economic development, pursuing progress of the peasants in our province. Besides the conservative ideology and lower cultural quality, they are also lack of market economic thoughts and educational conscious, and the cultural educational cause in the countryside develops very slowly. Certainly, some typical poor and remote mountain areas are also lack of effective means to use the advanced culture to guide and educate the peasants and lack of expanded cultural educational atmosphere.

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\* Project Achievements of Soft Science Project in Hunan Province    Project No.: 2010ZK3065

## **2.2 Develop the rural resources of our province and improve the peasants' science and technology cultural level**

In order to increase the agricultural production, improve the quality, optimize the agricultural planting structure in our province, the free use of agricultural science and technology requires the peasants to have better scientific and cultural qualities. Statistics showed that: although quantity of rural human resources in Hunan is large, the comprehensive quality is generally on the low side, which largely limits the process of new rural construction in Hunan. In every 100 rural labor forces, the quantity of lower than junior high school level accounts for 88.7%, the senior high school level for 11.2%, and the quantity of more than senior high school level only accounts for 1%. The cultural quality must lead to the lower level of peasants in our province currently.

## **2.3 Develop the rural resources of our province and fasten the process of agricultural modernization and industrialization**

Make full use of technology-enabled, specialization, and elaboration to improve the agricultural production, quality and value-added realization, which is not only the important means to realize the increasing ways of agriculture in Hunan, but also the important links to decrease the agricultural product cost and increase the income of peasants.

## **3 The Problems Existing in Human Resources Development in Hunan Province**

### **3.1 The rural human resources education level of our province is on the low side**

As the survey data showed, the overall level of taking compulsory education of rural population is at the low side. The population of taking elementary education accounts for 49.6%, taking intermediate education for 39.75%. Most peasants' cultural level is at the low side, without technology and with older age, relatively lower ability for learning and handling the technology, and the ones who can insist on the training are even less.

### **3.2 The stress on rural human resources development of the government is not enough**

In the process of rural human resources development and management, the rural social political, economic, and human resources development and management functions of government are very important. As the investigation and research showed, there is still a certain lack of government functions on rural human resources management in Hunan Province: such as the insufficient investment of rural educational expenditures. In recent years, although the development of rural education of our province is very fast, it is still slower than the economic development. The proportion of public educational expenditures of our country to GNP is wandering at about 2.5% for many years, which is lower than the average level of 4% in the developing countries. In such small public educational expenditures, we mostly invest the public expenditures into the urban important schools with good foundation, and invest few public educational expenditures into the rural and remote areas, which lead to the worse school running conditions of quite a few rural compulsory educations.

### **3.3 Lack of systemized developing plan and organisational system of rural human resources**

Our province is lack of unified recognition on rural human resources development and partial regions and counties have no unified labor developing management institutions or no systemized working policies and ways for rural labor developing management. Therefore, it is lack of overall investigation and research on rural human resources development, lack of initiative, positive and sense of urgency and lack of analytic hierarchy process in personnel training, which is rather blind, without forming unified organisational and planned system.

## **4 Build Rural Human Resources Development Evaluation Index System in Hunan Province**

Rural human resources development evaluation index has very important value for guiding rural human resources development work. By using multiple index comprehensive evaluation ways and through estimation on rural economic development level in Hunan Province, it needs to settle down two key technical problems: one is to scientifically confirm the weight of each index in the whole index system; the other is to scientifically make index dimensionless processing and confirm the "Quantized Value" of each index's actual value.

### **4.1 Conform the weight of each evaluated index in the whole evaluation index system**

Each index in weight system of rural human resources development level comprehensive evaluation system is a kind of measurement relative to contribution of rural human resources development level and different weight coefficients always lead to different evaluation results. The

valuation of weight system always has bigger randomness, and due to the different view of value, knowledge level and psychological concept etc., different people have different understanding of the importance of the same index, and even the same people would make different knowing and understanding of the same index in different time and social background. Therefore, it should always be the important area of that kind of research to strive to the scientificity and rationality of weight coefficient valuation of index system.

From the status qua of index system coefficient research at home and abroad, there are two types of subjective weighting and objective weighting for the confirmation of weight coefficient, but due to the subjective and physical influence of people, it is not only very difficult but also very incorrect to directly and simultaneously analyze and judge the weight of several indexes. In order to more scientifically confirm the contribution to overall objective of each index, we adopt the Analytic Hierarchy Process (AHP) and Delphi Method (Delphi) put forward by Professor T.L.Saaty, the American Scholar, to confirm the weight of each index. Firstly, it uses AHP to divide the index system into objective level, principle level and index level, and then focusing on each specific index, it adopts Delphi to analyze the weight of the principle level belonging to that.

**4.2 Eliminate the index dimension and make index "Value" quantized**

At present, there are many ways to make dimensionless processing to the index data, that is "Value" quantized. Considering two types to evaluate the index of homonymous index and contrary index, there is no clear quantity limitation of "Good" and "Bad" between indexes, which is with a certain fuzziness in a large part. Therefore, it adopts the fuzzy membership functions way put forward by L.A.Zadeh, the American scholar, to make dimensionless processing on each index.

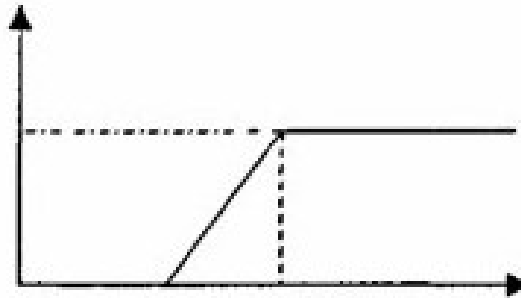
All kinds of fuzzy membership functions expressions and charts are as the followings:

4.2.1 The homonymous index

We use half-up trapezoidal fuzzy membership functions quantification, that is:

$$\phi_1 = \frac{e_{ij} - m_{ij}}{M_{ij} - m_{ij}} \begin{cases} 1 & e_{ij} \geq M_{ij} \\ \frac{e_{ij} - m_{ij}}{M_{ij} - m_{ij}} & m_{ij} < e_{ij} < M_{ij} \\ 0 & e_{ij} < m_{ij} \end{cases}$$

The chart is as the following:



4.2.2 The contrary index

We use half-drop trapezoidal fuzzy membership functions quantification, that is:

$$\phi_1 = \frac{M_{ij} - e_{ij}}{M_{ij} - m_{ij}} \begin{cases} 1 & e_{ij} \geq M_{ij} \\ \frac{M_{ij} - e_{ij}}{M_{ij} - m_{ij}} & m_{ij} < e_{ij} < M_{ij} \\ 0 & e_{ij} < m_{ij} \end{cases}$$

After our summary, the survey result is as the following:

Principle Level (Level A)		Index Level (Level B)		
Index of Level A	Weight	Index of Level B	Weight	
Comprehensive Evaluation Index System of Rural Human Resources Developing Level	0.3	A1 Resources Distribution Condition of Rural Human Resources	B1 Proportion of rural workers accounting for the total population	0.18
		B2 Proportion of non-agricultural employees accounting for rural agricultural workers	0.19	
		B3 Proportion of per capita salary income accounting for net income	0.22	
		B4 Per capita agricultural output	0.21	
		B5 Proportion of peasants with junior college degree and above educational level	0.20	
	0.3	B6 Per capita life expectancy	0.18	
		A2 Guarantee Level of Rural Human Resources	B7 Number of village doctors and health workers in per thousand agricultural population	0.21
		B8 Death ratio	0.17	
		B9 Proportion of national investment to rural healthcare, social security and social welfare accounting for total investment to rural	0.22	
		B10 Proportion of rural residents medical care expenditure accounting for living expenditure	0.22	
0.4	A3 Developing Ways of Rural Human Resources	B11 Proportion of national investment to rural education accounting for total investment to rural	0.34	
	B12 Proportion of national investment to rural culture, sports and recreation accounting for the total investment to rural	0.32		
	B13 Proportion of rural residents stationery and recreational products and services expenditure accounting for living expenditure	0.34		

## 5 The Solutions and Suggestions on Improving Job Performance of Rural Human Resources Development

### 5.1 Optimize the governmental functions of human resources management in Hunan

Firstly, the government can establish and specify the systems of rural human resources support and guarantee and increase the investment on rural education, culture and healthcare to build good external environment of human resources development as far as possible. For example, it can increase the support to the county-level financial resources, realize the effective investment on rural education, set up preferential policies for introducing rural talents as far as possible, and attract excellent talents to dedicate into the construction of new rural. Consideration could be made to build mutual cooperation relationship with the local schools, especially the rural schools, and invite experts as well as relevant professional personnel back to the rural to make technology guidance regularly or irregularly.

Secondly, optimize the social security functions. The government can widely open the financing channels to appropriately develop and perfect different forms of security systems of rural endowment insurance, unemployment insurance and rural cooperative medical and form the multi-level rural social security system combing with social insurance, social relief, social welfare, special care and placement and social mutual aid, personal savings accumulated security systems.

### 5.2 Actively build the training system for rural education in Hunan

For the rural human resources development, the most effective and direct way is to strengthen rural education. Through various ways, we can actively develop the rural educations systems including preschool education, basic education, adult education, job education and skills education etc., renew the educational content and reform the teaching ways and means to virtually ensure that the content of rural educational training is consistent with the actual requirements of the rural production activities, especially clearing out the objective of rural job and technology education. The main tasks of rural job and technology education are to promote agricultural technology and truly allow the peasants to be the practicality talents of handling technology and scientific farming. In educational practice, there are not

only to instill the theoretical knowledge to the peasants but also to adopt the participating training ways to connect the theory with practice so that the peasants can improve their skills through mutual learning. In adult education, it needs to specially strengthen the training on instructing a child, health care, self-protection and productive skills for women.

### **5.3 Construction of the new rural science and technology service system**

In the countryside, the rural science and technology service system is the strong force on promoting the progress of science and technology, with profound influence on the countryside development and even the overall development and progress of rural social economic of our province. It is the important organisational guarantee on promoting the science and technology progress and the middle bridge on realizing the conversion of science and technology to practical productive forces. Therefore, our province urgently needs to construct the new rural science and technology service system.

Firstly, actively develop the rural science and technology co-operation

Rural science and technology co-operation are a kind of new science and technology service mode sprang up in recent years. It is the new mutual cooperation organization combining the peasant households engaged in planting, cultivation, farm products processing, technology, and marketing etc. to form the economic community of interests and facing the mass peasants to provide services of agricultural production information, science and technology training, science and technology information etc. In Hunan, especially after the establishment of the rural science and technology co-operation in Shuangfeng County, Loudi City, it set up 16 unions, 320 branches and nearly 9,000 members, set up the rural science and technology demonstration base, undertook the municipal important science and technology project and gained the obvious achievements. Now, our province shall widely promote the rural science and technology co-operation and make actively development and growth to play its functions covering the whole province.

Secondly, strengthen the peasants' professional cooperation organization in our province.

Peasants' professional cooperation organization is the organization based on household contract management, with the main members of peasants, to carry out the mutual help and cooperation around the related links of one profession or product, and is a kind of organization form for self-service, self-development, and self-protection of peasants. The organizations can be the effective means and ways to rapidly speed up the agricultural development, push forward agricultural scientific and technological progress, and promote the increasing income of peasants. The countryside in our province can greatly strengthen and promote the construction of peasants' professional cooperation organization through the advanced experience of other provinces and cities.

Thirdly, make full use of the civil organization to implement the development job.

Civil organization is the effective means for cultivating the new peasants with culture, technology and operation ability. The training to the peasants pays more attention to the practicality, pertinence and effectiveness of the educational content. It not only correctly guides the changes of the peasants' ideology, but also provides positive guidance on the information technology. It can also advocate the ideas of life-long learning, all people learning and mutual learning in the countryside and build the learning environment and atmosphere to truly and effectively develop the rural human resources and improve the quality of rural population. The rural area in Hunan shall make fully use of the flexibility, practicality and local nature of the civil organization to implement the rural human resources development job into practice.

## **6 Conclusion**

In conclusion, the rural human resources condition in our country is worrying, which is not compatible with the characteristic of large quantity. From the developing history of developed countries, the rapid increases of agriculture are all benefited from investment on human resources. On this study's opinion, under the situation of economic competition globalization and knowledge economic domination, developing rural human resources in Hunan Province in our country under the rising strategy of Central China and building modern agriculture have great theoretical and practical value.

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## Research on the Basic Mode of the Innovation

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**Abstract:** Innovation is about doing things no one has done before, or things most people have not yet known or recognized. This paper examines innovation from five aspects. Uncontroversial innovations are considered non-innovative. Independent innovation is not private innovation. Conceptual innovation represents the highest level of innovation. Innovation should be moderate. We should be kind to innovation and be adept at innovating. This paper proposes that innovation will definitely cause controversy and conceptual innovation is the premise for all the other kinds of innovation. It concludes that if a company wants to survive and develop in the market, it must be kind to innovation and get adaptation at innovation. The paper gives some basic mode of the innovation, further to recognize the essentiality of the innovation.

**Key words:** Uncontroversial innovation; Private innovation; Conceptual innovation; Basic mode

### 1 Introduction

It is no exaggeration to say that all innovations or inventions, from natural sciences to social sciences, from system to management, from Newton's universal gravitation to the Wright brothers' aircraft, and from China's Four Great Inventions to the never-ending technological revolutions, could cause controversy at all times and in all countries. Both history and reality have told us that innovation will certainly cause controversy and uncontroversial innovations are considered non-innovative.

### 2 Uncontroversial Innovations are Non-innovative

Innovation, except in the economic context, generally refers to doing things no one has done before, or things most people have not yet known or recognized. Accordingly, it means a challenge to the existing concepts, practices and results to do things unprecedented or not widely recognized and accepted. It also denies past conclusions and creeds, breaks the recognized order and violates original rules, thus inevitably arousing considerable controversy and probably encountering encirclement and suppression.

For innovations and innovators, being controversial is neither a curse nor a derogation. Instead, it is a sign of progress, a process coming before being recognized, understood and accepted, and thus it should be seen as a praise. Since ancient times, countless innovators have been ridiculed and even sacrificed their lives both in China and in foreign countries. For example, the world-renowned inventor Edison who invented the light bulb and the phonograph were often cursed by others as a fool. Copernicus who rejected the geocentric theory having been accepted for over 1,000 years and developed the heliocentric theory of the solar system, was obstructed by the church in every possible way for upholding the truth. On the contrary, in the face of challenge and controversy, some adventurous innovators who have the courage to sacrifice individual interests and to withstand the pressure of failure, become dumb and withdraw from advancing, and ultimately give up halfway. That is because they cannot interpret the controversy over innovation in a right way.

In the course of China's reform and opening up in the past 30 years, every little progress and advancement has aroused considerable controversy. Some people argued that the establishment of Shenzhen Special Economic Zone was not a socialist practice; some people said that the principle that practice is the sole criterion for testing truth was a comeback of the traditional concepts; some people maintained that the market economy with socialist characteristics was a form of capitalist. In the face of these arguments, Deng Xiaoping pointed out: "Reform and opening up involve great courage", and "If we don't have the pioneering spirit, if we're afraid to take risks, if we have no energy and drive, we cannot break a new path, a good path, or accomplish anything new. Who dares claim that he is 100 per cent sure of success and that he is taking no risks? No one can ever be 100 per cent sure at the outset that what he is doing is correct." Deng Xiaoping put a daring and innovative interpretation on the relations between innovation and failure, and between innovation and argument.

Innovation and controversy rebound upon each other. The basic mode of this opinion is that:

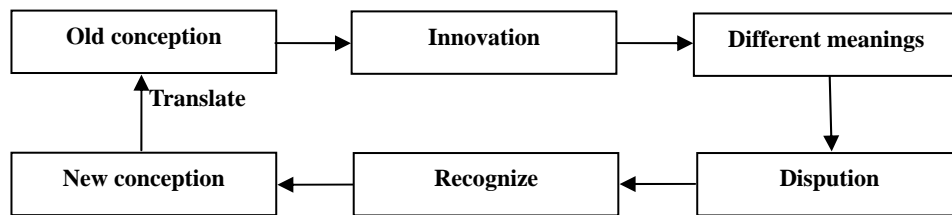


Figure 1 The basic mode of the innovation in controversy

It is innovation and controversy that decorate historical development and social progress and save human thought and spiritual civilization from being stagnant. With them, the world has painted brilliant pictures, left people wonderful memories, and created considerable spiritual and material wealth. The controversies whether they are right or wrong are among the heroes who strive for reforms, promote technological and social progress, and challenge the existing order and rules are born. It is also through these controversies that we see the reality behind illusion and conservatism, and see the twists and turns behind events. To settle these controversies, innovators should keep a low profile to bide their time, keep themselves from distractions, and always keep advancing. Moreover, history and practice will make proper conclusions.

### 3 Independent Innovation Is Not Self-appointed Innovation

Nowadays, the concept of independent innovation and its importance have been widely recognized and accepted. It arouses great enthusiasm and a conscious action that a top-down and a bottom-up innovative practices which have been launched throughout China.

However, some enthusiastic leading cadres and businessmen have a biased understanding of innovation, and believe that independent innovation should take place domestically, locally, or within enterprises, and that the innovation process should be mostly based on secluded innovation. In fact, the main body of independent innovation is the self, but it does not mean to seclude oneself from other countries or other people. Instead, it requires an open mind to actively introduce and absorb all the advanced technology and experience.

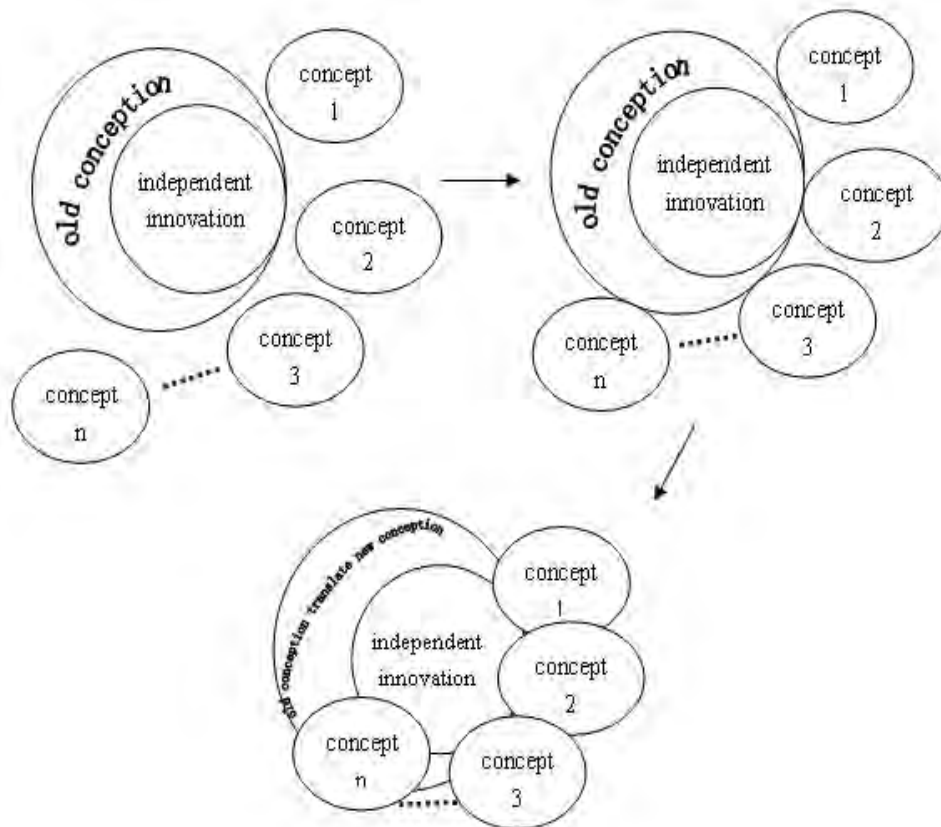
According to authoritative experts, independent innovation advocated by the CPC Central Committee has three meanings: first, to strengthen original innovation, and strive to obtain more scientific discoveries and technological inventions; second, to strengthen integrated innovation, center on products and major industries, organically integrate a variety of related technologies to form competitive products or industries; third, on the basis of introducing advanced foreign technology, to enhance digestion, absorption and re-innovation abilities. These three points are interrelated and equally important.

Independent innovation is not secluded or private innovation. Scientific discoveries and technological inventions are the products of the continuous interaction of different ideas. Therefore, the premise of innovation is openness and extensive exchanges. We should absorb other people's research findings all over the world as much as possible so that we can start from a new departure and make new progress. So the basic mode of the independent innovation is that:

China has made certain achievements in terms of original innovation and integrated innovation, and has thought high of introduction of advanced technologies, but little of digestion, absorption and re-innovation. The relevant data show that Japan and South Korea, in the economic take-off stage, spent 5 to 8 dollars on the absorption and re-innovation of the introduced technology worth 1 dollar. However, the figure in China in 2004 was only 0.18 dollar, resulting in a serious imbalance between technological introduction and technological absorption and re-innovation.

Some people say that Chinese people are able to produce satellites, missiles, and spacecraft on their own, not to mention other products, and therefore they do not need to rely on foreign technology. It should be noted that innovations in satellites, missiles and other non-market products are completely different from those in market products. The former category is not subject to the laws of market competition. Some countries may focus their national strength on developing the atomic bomb even if they have lagged behind other countries for decades, but their atomic bomb is equally lethal and influential. The vast majority of other products are subject to the constraints of market competition, and they must race against time and fight for opportunities. Once missing the opportunity, a company will

have few market shares even it has developed the same product as other companies who have already occupied the market.



**Figure 2 The Process of the Independence Innovation**

In the era of economic globalization, it is by no means an easy thing to make innovations in all products just behind closed doors. In a sense, independent innovation requires us to use international resources, to move forward quickly from atop the shoulders of our predecessors, and to put more effort into the integration of global resources for our own use. As we improve domestic experience in technology and management, we should also legally and proactively absorb and utilize the innovative resources, technical resources, and human resources of any other country or company. Therefore, only with a more open mind and more open measures will our road of independent innovation be broader, longer and more effective.

#### **4 Conceptual Innovation Represents the Highest Level of Innovation**

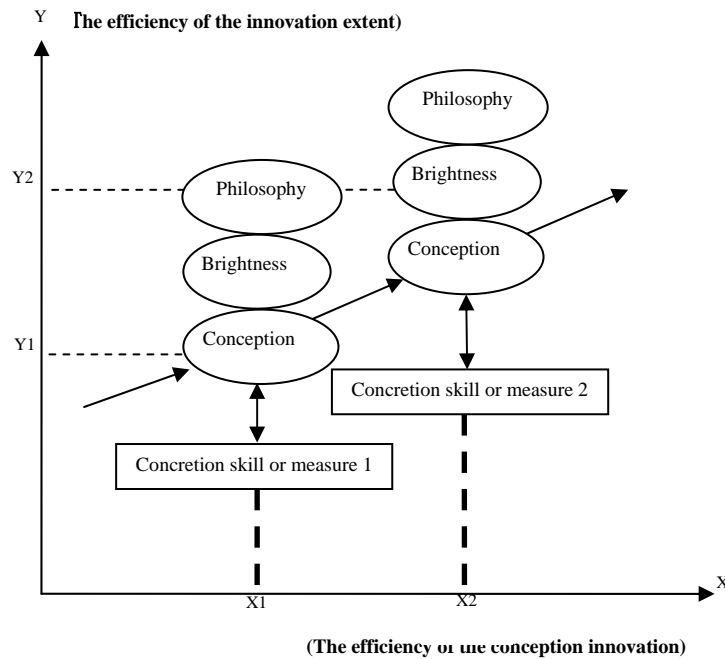
The concept of innovation was first proposed by the Austrian-American economist Schumpeter in his book *The Theory of Economic Development* in 1912. From an economic perspective, Schumpeter defined innovation as a new combination of means of production and listed five major types of innovations, namely, a new good, a new method of production, a new market, a new source of raw material, and a new organization. Nowadays the concept of innovation has gone beyond its economic significance and covered the fields of economics, sociology, behavior science.

Innovation, as a cognitive and practical ability specific to humans, has three levels which are the sense of innovation, the spirit of innovation, and the innovation ability. In terms of its contents, it can be divided into theoretical innovation, institutional innovation, technological innovation, conceptual innovation, management innovation, technical innovation, product innovation, service innovation, organisational innovation, marketing innovation, cultural innovation, and so on. In today's rapidly changing world, a company's speed of making innovations in its products becomes a sign of market dominance. To survive and develop, companies must keep up with the constantly changing situations,



and take a proactive role in making innovations in management, technology, products and so on, so as to ensure its dominant position in the market. Product innovation is based on technological innovation, the basis of which is conceptual innovation. Consequently, conceptual innovation is a prerequisite for all types of innovation, plays a decisive role in business development, and gives an inexhaustible impetus to business prosperity.

Concept, also known as knowledge or thought, is the sum of the ideas and notions developed from existing knowledge and long-term practice. Conceptual innovation means to change some wrong, outmoded and impractical established ideas and modes of thinking, observe things from a new viewpoint, then draw a new conclusion or form a new idea, and ultimately adopt a new attitude and approach to acting. Conceptual innovation, in essence, represents a revolution in ideology. So the basic mode of the conceptual innovation is that:



**Figure 3 Efficiency Conception Innovation Curve**

Figure 3 give the relationship between the efficiency of the conceptual innovation and the efficiency of the innovation extent. The formula like that:

- 1) Set the efficiency of the conceptual innovation as X
- 2) Set the efficiency of the innovation extent as Y
- 3) Set the extent as n

Innovation extent is as follow:

$$Y = X^n$$

Form this chart and formula the efficiency of the conceptual innovation will growth so faster when the efficiency of the conceptual innovation is more.

Conceptual innovation is a process of self-denial and self-transcendence. It transcends not only the traditional ways of thinking, but also the established patterns of interests and regular practices, which means that it is a painful and difficult process for companies to make conceptual innovations. Firstly, conceptual innovation requires the quality of self-denial. Self-denial means to give up outmoded ideas, to break the old work mode and mindset, and to establish a new concept. Instead of sticking to established practice and blindly copying others, a company should learn from others' successful experience to explore and create distinctive ideas and methods in accordance with the actual conditions of the company. Secondly, conceptual innovation is not about doing unconventional things without foundation, and it must be based on itself on certain theoretical knowledge and innovative knowledge. Thirdly, conceptual innovation requires creative thinking. Creative thinking is a thinking activity with groundbreaking significance, it is not an application or a representation of established knowledge, but a way of thinking through which one can get rid of the fixed concepts, rethink a problem form a new

perspective, and finally get a creative answer. With creative thinking, a company, according to its internal conditions and external environment, will become adept at discovering and seizing the opportunity to quickly make decisions, and making a new combination of business elements at critical moments concerning the fate of the company, so that the company will win in the market competition for novelty and persistence.

As for a pile of wood, if used for burning in fires, it is almost worthless; if sold as materials for furniture, it may be worth tens; if made into furniture by a carpenter, it will be worth several hundreds; if it is further collected by an artist or a collector and then sold as a work of art in an auction house, its value will be doubled many times. According to the rules of market economy, there is no other way out but to make conceptual innovations. Slavish imitations of others hardly bear fruit today. Ideas determine the way out, concepts create wealth, and different concepts bring about different results.

It is noteworthy that there is no end to conceptual innovation because the new concepts today may become old ones a few years later.

## **5 Innovation Should Be Moderated**

Almost all the people who fight in the market know very clearly that they must surpass their competitors in terms of business, technology, and even products, in order to lead the trend and gain the upper hand. This principle of "a half step ahead" is frequently heard in business circles.

Theoretically speaking, there is nothing wrong to be ahead in terms of development. But in practice, it is not that easy to determine the extent of being ahead and whether being ahead will give impetus to development. Like in a sports game, the one that runs ahead of the others is just temporarily leading, and he may not be the final winner.

At the end of the last century, the Iridium Program launched in the United States caused a tremendous sensation in the high-tech industry. As a Chinese Long March rocket participated in the launching of several Iridium satellites, the author got the opportunity to know something about this program. From 1987 to 1998, Iridium Communications Inc. had spent over 5 billion dollars launching 66 satellites, and had built a wireless communication network covering every corner of the world, so that mankind for the first time was able to directly communicate with one another without depending on the terrestrial network. Even today, the Iridium satellite constellation is technically leading-edge. But precisely because of its excessively advanced technology, calls made to and from Iridium phones were as high as nearly \$30 per minute, the bulky brick-like handsets were priced up to \$3,000, and territorial maintenance systems and facilities were extremely expensive. The Iridium satellite phone thus was regarded as the noble phone. The competition from other mobile communications providers that provided lower call charges and smarter phones was another major factor in the company's failure. A series of cruel facts dragged the business operation of Iridium satellite into a trough, and ultimately led the Iridium satellite phone network to bankruptcy.

Similarly, in the 1970s, Sony Corporation first developed the home portable video recorder. However, in order to bring its products to market, Sony had to choose one of the two competing technical standards of tape cassettes, namely Beta and VHS. The Beta format was more sophisticated in recording quality, and required small-sized cassettes, thus reducing the size of the video recorder, but a Beta cassette could only record one hour. The only advantage of the VHS format was a longer two-hour recording time. Which one to choose? Sony's technical director said with confidence that as long as they had developed good products with the leading technology, customers would naturally be attracted. Obviously, the "technological" Sony believed that the leading edge in technology would undoubtedly bring success, and therefore chose the Beta format which it considered better. Panasonic, however, formally adopted VHS in 1977. In less than a year, Panasonic gained a 33% market share, the same as Sony's. Sony took this as the biggest humiliation since its founding. The reason is that recording quality as a notion only making sense to experts was beyond the perception abilities of ordinary customers. What consumers cared about most was the recording time. Morita Akio, the founder of Sony Corporation, introspectively remarked: "A video recorder with a two-hour recording time is undoubtedly better than one with a one-hour recording time. The root cause of our failure is the gap between our excessively advanced technology and the market."

It should be noted that Iridium Communications and Sony have learned bitter lessons from the fierce competition in the multi-market where great differences exist between the ideal and the reality, between technology and market, and between the subjective and the objective. If a company relies on only one advantage like technology or quality while lacks the grasp and control of the various elements

of the market economy, and if it cannot combine its products with the market, consumers, environment, and product performance, it will not be able to win in the marketplace and make profits, and it will be trapped in a predicament and finally go bankrupt instead.

Advances in innovation and development should be moderate. The contradiction between advance and moderation will change qualitatively if it cannot be handled properly. How should a company deal with this contradiction to make advances moderate? Actually, it needs to mainly deal with three aspects, the first of which is consumer affordability in terms of consumer psychology and consumer habits. Some products are so fashionable and ahead of market expectations that consumers may not accept them because they are not in line with consumer habits. The second aspect is consumer affordability of the cost. Generally speaking, the more advanced a product is and the more functions it has, the higher it will be priced. If a product is moderately advanced and cost-effective, it can satisfy consumer curiosity at affordable prices. The third aspect is technological sustainability. Advances in development will not be possible without advanced technology. Under normal circumstances, if a company divides technological development into stages of different levels, and finds new ways of doing things from old theories step by step, it will achieve maximum results with little effort.

By examining the lessons learned by our predecessors, we can find that anyone who commits to the theory and practice of advanced development must have the vision and courage to size up the situation and accurately learn himself in the market. Otherwise, haste makes waste, and the hero became a martyr.

## **6 We Should Be Kind to Innovation and Be Adept at Innovating**

Innovation is an everlasting theme of humans, and the fundamental driving force for social development. Innovation is an exploratory journey full of both frustrations and opportunities. Innovators should possess courage, mettle and perseverance all the way, and they may turn all the previous labours to nothing at any moment. Once at a company's year-end summing-up meeting, the technical staff who received handsome bonuses for their achievements in scientific research said emotionally that they would not have achieved such results without the support of their superiors and the tolerance of their co-workers. An entrepreneur said: "Innovation involves an adventurous spirit, and adventure means risks, which may cause failures. Only fearlessness in the face of failure will bring success." It was his words that aroused my sentiment that we should be kind to innovation.

To be realistic, no one wants to fail in innovation, but no one can avoid failure. The American inventor Thomas Edison invented the light bulb after he had carried out 1001 experiments. After having experienced painful failure for countless times, Wright Brothers invented the airplane, and Bell invented the telephone. Kindness to innovation and tolerance of failure will make people steadfast and earnest in their work. If someone is impatient, impetuous, and also eager for quick success, and if he cannot wait to get instant results and feel utterly discomfited in the face of failure, he will ultimately receive the opposite results and get more a loss than gain. Harsh demand for success will trammel innovators and put an pressure on innovation in an invisible manner, causing people to follow the beaten path, hesitate to move forward, and even unscrupulously resort to deception. Science is about taking pragmatic approaches to problems. Science is honest learning, allows not one iota of falsehood and involves hard work. By admitting, allowing, and tolerating failure, we can advocate an innovative and risk-taking value, provide an open and tolerant cultural spirit, and create a peaceful, practical and innovative social atmosphere.

In fact, failure also means a kind of wealth. Many companies and entrepreneurs at all times and in all countries have attributed their success to their tolerance of failure. Each step and leap in the history of human civilization has gone through various kinds of hardships and difficulties. By learning lessons from the numerous failures, humans have succeeded in making progress. As a virtue and a state of mind, tolerance of failure has now become a stress-relieving encouragement to innovators, the best recipe for motivating losers to turn defeat into victory, and a new thinking mode and a new mechanism to encourage and protect innovation as well.

It is no wonder that the president of Johnson & Johnson has treated failure as their most important product. That is because a tolerant environment will expand the room for innovation in an invisible way.

The Dutch-American writer Hendrik Willem van Loon in his immortal masterpiece *Tolerance*, basing on the major events and important figures in Western history, made rational thinking on the importance of the tolerance of society and people. As the result of human rationality's transcendence of human nature, and as the product of the evolution of human civilization, tolerance can effectively eliminate mutual hostility and cool down conflicts, and thus becomes extremely valuable.

However, tolerance of failure does not mean to connive in irresponsible and aimless behaviors, or to act in haste and with indifference. Instead, it means to stimulate people's spirit of challenge and courage to overcome all difficulties, to treat failure as a stepping stone, to always maintain the passion for innovation, and to tirelessly climb to the heights of science.

## 7 Conclusion

Innovation is not like a river without source, or a tree without roots. Innovation is neither a blind and unconscious behavior innovation nor a whimsical notion. Moreover, innovation cannot abandon its nature characteristics separate itself from history, and proceeds without guidelines. It must base itself on a full understanding of things. To fully understand things and find out their laws and relations, innovators must see through the appearance to the essence. In a sense, to be brave to innovate is hard to be good at innovation is much harder. The former is an idea and a spirit while the latter is a kind of ability and a skill. Innovation is the product of the continuous accumulation of theory and practice. We should constantly work over new situations and solve new problems, in order to create more and better innovations that correspond to and promote social and economic development.

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# The Brand Operation Based on the Design Management

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**Abstract:** Based on the point of the design management, from four aspects, recognition design, brand story, perceptual pursuit, and service design, discusses practice experience that design how to cut and service in brand management. Reached the following conclusion: (a) Successful enterprise and brand innovation is all through the highly strategic image design achieve. (b) Enterprise and the value of the brand once be styling for story, the story was given brand theme.(c) Experience marketing is the ultimate goal for consumers to create integrated experience. (d) The products should be from the perspective of service design consumers and the users of the Touchpoint.

**Key words:** Design management theory; Brand management; Identify design; Brand story; Perceptual appeal; Service design

## 1 Introduction

“Design is a process of consumer satisfaction and company earnings for the optimization. This process is through the creative use product, environment, information and enterprise recognition associated main design elements (efficiency, quality, durability, appearance and cost) to fulfill.” As defined above points out, the designer combine consumers’ demand and enterprises’ goal, and create the right performance, excellent quality, positive aesthetic features, and have effective function on products and services. Obviously, the design is a kind of complexity of interdisciplinary activities. Nowadays, the design uses innovation as the main body to contact with the whole society and become to a multidisciplinary integrated activity of fusion art, technology, management.

“Design is a very important, has enormous potential management resources, like any other management resources, vulnerable to guide and control of wisdom.” Design process need to be effective management, as enterprise activities need to test and control mechanism. Effective design management has become one of the most important elements of enterprises’ success. Design management is the related design activity through formal rigorous program to organize in the enterprise internal, and a process of making design into practice. Or rather, design management is the process of management used in innovation and design process. And because design widely expansion, design management is no longer limited to the interests of the enterprise or create the future management of the enterprise, its significance has expanded to practical field. In short, design management can be understood as a strategic means of innovation, including management methods to establish the enterprise image.

In simple terms, the brand is refers to the special character of the organization, products and services. The concept of brand start from advertising goods, and now is across business and others. The development team, band, charity, and even the urban and country began to think of brand management, its meaning is gradually expanding. The of the so-called brand management, to consumer, it is emphasized and uniform to put forward the behavior “what is the kind of relationship of company or product”, and “what exists for?” Making the design for visual brand, in order to understand the brand’s prospect and the recognition and how to perform strategic. In other words, if the brand is the communications media between enterprise and consumer, design is the important channel between the enterprise and the consumer for depth of dialogue. Design management related brand has absolute effect on the ascension of the brand value. Based on this, researching on the design how to cut and service in the practice of brand marketing has the full meaning.

## 2 Identify Design

Brands have become the standard of consumers’ choice as for those commodities are neither been bought nor been used. The function features are tending to standardizing nowadays, so products need being differentiation to survive in the competition. It has been the most important topic for companies to establish their own exclusive features and keep consistent image or style.

Now design is not just packaging or decorating the appearance, it has already extended to multiple activities including product and environment, the enterprise and the consumer. Enterprises begin to pay close attention to all the elements of visual impact. for commercial identification industry, it will be fully necessary to contact strategic with diversified, especially the recognition design, which is a field to

complete speedy multi-function integration programming. **Balmer** think Business Identity represent the integrity of company or group and the product or service, but Identity Design is to build relevant designs of brand integrity. Today identify design is not just graphic design or brand concept, it tends to develop products directly. This diversified operation is helpful for building consistent brand image and innovation application.

“Design should have the function of the overall and consistency in business communication. The visual image is not only the package and product design but also to introduce consumers the whole process of the products’ effect being extended. From those successful brands such as Dyson, Apple or Stanley toys, we can see that the product design and the brand image has a very close combination.”

In order to lead such a success brand not only leading tide but also being always integrity, trademark or packaging has being regarded as specific elements to perform product itself Brand Identity. Dividing internal organization with strategic and skillfully is the key for brand design and design service. The application and feedback stage before and after the completion of the image design is indispensable. The revision of business image in practical application should be together with reinforcing the management process. The related enterprise engaged in image design should not simply to carry on the design, but to focus more on changing the strategic management of enterprises. Seeing from the current globalization trend, successful enterprise and brand innovation are all achieved through the highly strategic image design.

The so-called differentiation strategy is how to perform the management philosophy of enterprises centered in social and cultural background. We are looking forward to brand information and consulting company with a better understanding of the country, industry and district, which can not only reflect the world trend but also realize the integration of brand strategy and design, and enhance the national design competition finally.

### 3 The Brand Story

Owing to the standardization and generalization of technology, the differences between product function and quality have been narrowed. And the consumers often decide whether to buy or not through invisible spirit rather than tangible technology and function. **Jensen** predicted that the future of the enterprise will pass to provide customers with dreams and the genotype perceptual experience to create value. The global market has witnessed the success of enterprises, such as Apple, Nike, and Ferrari. They plant exclusive designs in their unique interactive experiences with customers and at the same time, make the connotation shared by all the members of the enterprises. In the past, most enterprises would promote all kinds of uses of their product through limited media and reach. Nowadays, enterprises can employ two-way interaction media to convey the brand story and connotation more effectively through customer experience and perceptions.

The story is a major means for human communication. In modern business field, beyond the preexisting story significance, people-oriented value is now playing a growing role in evaluation. **Fog** found that in modern business field based on a modern society dominated by the characteristics of perceptual brand building, let the story happen, highlight its importance, and make the customers enter the story and realize the brand value through interaction. As soon as the enterprise and the value of the brand are contained in the story, the story takes on a brand theme. Tell of the story is not monotonous but joined by the core value of the enterprise and the brand, which aims to strike an impression on customers with brand through an interactive way, and to regenerate within the story. The story may have a “rest” since the consumers might find perceptual resonance with the core value of the brand and enterprise, and their positive attitudes and loyalty to the brand may develop.

**Riel** and **Fombrun** believe that the brand story is itself an advertisement or brochures or other forms of promotion to convey its true purpose, that’s to say, the nature of the enterprise through various media integration. Obviously, customers have access to diversified contact points with the brand, and the brand story enhances the interactive effect. Flagship store transcends the general conception of sale and purchase, and it also provides chances for customers to directly experience the brand connotation. Flagship store can convey enterprise features and uniqueness through various direct experiences, and the brand can differentiate itself through media. In order to avail of flagship store in telling brand story, the enterprise needs to decide a brand positioning, the characteristics and considerations toward enterprise reputation, the value of the brand, even the tone and manner of the shopping guide included. These are necessary elements of the story. Thus, the enterprise can reach to the consumers by unique charm and stand out among many other brands, boasting experience of distinctions, rather than pure functional

competition. And this makes brand development becomes possible.

#### 4 The Perceptual Appeal

After the 21st century, society quickly changed from mainly attaching importance to the products producers to brand creation and consumer experience of the orientation of the consumer environment. Consumers didn't focus the functions of products but to pay more attention to consumer experience. Consumers spending, are more likely to seek for meeting perceptual Desire consumption, rather than functional Needs. In order to meet their needs, consumer now expects to understand their brand culture and life style through the design of perceptual experience, .

**Marc Gobe** thinks, "The designs of perceptual brand lies in consumers' personal and objective perspective. They need to have a strong connection with the brand, which gives credibility and personality to the brand. The ultimate goal for consumers marketing of experience is to create integrated experience." According to the consumer sensibility understanding of the requirements, to realize the brand and the consumer "perceptual connection" between the brand designs, that is the enterprise survival strategy, but also the most effective method to improve the market share.

In addition, now the consumer thinks, enterprise not only has the obligations for employees as employers, they should also be to implement their social responsibility, and has led the prospects of the social advancement and leadership. When enterprise accord with these conditions, consumers will give brand reputation, the performance of trust and loyalty. **Fombrun** think, in various elements for forming the reputation of the enterprise, perceptual appeal is the most important one. To judge the reputation of the enterprise, the biggest factor for the consumer is the past experience according to the evaluation by the personal feeling. In use of the products, firstly consumers experience the part of the beauty and significance, thus create perceptual experience, with the intervention of subjective judgment. Enterprise should be realized the importance of consumer perception experience, through the appropriate catalysis, and guide the positive feelings for the consumer, and then set up a good brand image and value cognition.

The building is able to provide the perceptual experience space; the building is able to provide the perceptual experience space, through the variety of space design, it provides differentiation image of the buildings, plays the important role that tracts consumers' positive emotions. Now in so fierce economic competition, according to various elements of the image consumers will evaluate enterprise, the enterprise should not stay in narrow sense of brand management that is related to the enterprise image. **MIT** architecture professor **Anna Kelinmann** pointed out that, for economic and cultural evolution, it can use the building to be strategic communication medium to do the concept of performance brand. Especially the automobile industry, in this industry, technology and enterprise image is in the difference and reliability is very important. The car is not just a pure product; it is the perceptual and the integration of the sales experience. Making building space into experience, the representative enterprise is Mercedes-Benz. Located in Stuttgart, Germany Mercedes museum, it makes the history of the enterprise as the center, and shows the company's core model. In the museum, there are exhibition cars, it gets rid of the pure display the identity of the products, it is considered to be the cultural and scientific development of axis, so that visitors can know the history of Mercedes-Benz. Mercedes museum architecture's internal and external form, bearing the brand culture and history of the cars, and using the interactive display to experience the perceptual content, from different senses level will "the enterprise leading the auto history is Benz", so rich memory in the visitors heart imprints, greatly enriched the brand image experience.

#### 5 Sustainable Design Services

As technology and social development's compound development, the products should choose the perspective of service design to cut consumers and the users' Touchpoint. Service design, that is, through the design promote service provider (Enterprise) and services (Customer) beneficiaries' communication, the ultimate goal is to create value through the communication with customers. Britain's representative service industry **Engine Group** said: "service design is the definition of opportunity of the service and characters, through the Touchpoint offers service experience to customers. In order to be sustainability, the focus should be on developing enterprise organization system and procedure of things."

Service design is the foundation of modern innovative tools' concept evolution. Technology high speed development, product cycle short, consumer orientation and consumption environment change,

under the guidance of these requirements, providing the appropriate products and service is the successful way of enterprise and brand. "How good Products and services is, how strong brand is, it still need good operation system to support. In order to provide better service to customers, it should have the right resources to fit the market, customers, designers, manufacture industry, and also have the answer system." Dell is the best example set up a good brand through Mass Customisation. This user generated strategy, it not only the customer get diversity products, but also make the enterprise reduce the financial burden, improve the price competitiveness; Promoting relations between the enterprise and customers, and also to improve the customer brand loyalty.

Sustainability and Green Design is considered to be synonymous time has past now enterprise's pursuit is Sustainability, including with social, environmental and economic integration vision, guiding design products, space or service. People expect enterprise in addition to obey the law, also have the morality, rational to promote society's harmonious development. Enterprise should consider including reducing costs, protecting the environment, improving local quality of life, and many other aspects, from this can keep a more intimate and stable relations with consumers. so as to achieve long-term goals and value.

Stylist should have their own responsibility between producers and consumers must give value to their position and role. The designer should take responsibility to the environment consciously. In order to promote the social and economic values and interests, they should have a more profound understanding of the concepts and make it into practice actively. In the Design, through the so-called Design Review regular meeting, collecting all field experts, as far as possible to exchange ideas and research the sustainability of products.

## 6 Conclusion

(1) Successful enterprise and brand innovation is all through the highly strategic image design achieve.

(2) Enterprise and the value of the brand once be styling for story, the story was given brand theme.

(3) Experience marketing is the ultimate goal for consumers to create integrated experience.

(4) The products should be from the perspective of service design consumers and the users of the Touchpoint.

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# The Analysis of the Policies on Service Innovation in Service-Oriented Enterprise

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**Abstract:** The service sector is a significant part of the national economy, the level of development of the service industry is an important symbol to measure the degree of social economic life in modern society. For service enterprises, service innovation is an important source to push forward the development of enterprises. Combined with the current development of our national service enterprises, we believe that we should raise our awareness to strengthen organisational leadership and co-ordination, and implement various incentive policies to promote innovation, creating an innovative environment to nurture innovation objects, giving full play to the linking role in production and spreading, enlarging international and regional exchange and cooperation and activating the enterprise innovation ability ,in order to promote the innovation of China's service-oriented business services.

**Keywords:** Service sector; Service innovation; Countermeasures

## 1 Introduction

The service sector is the fastest growing industries in the world economy. At present, in some developed countries, the service industry has accounted for about 55 percent of the gross domestic product and few countries even reached 75% or more. With the rapid speed, the service sector and its production far beyond the average level of growth of the service sector. In 2007, On Accelerating the Development of Services (issued by state [2007] 7) pointed out “the service industry is an important part of the national economy, and the level of the service sector is an important symbol of the degree of modern social life and economy.”CPC Central Committee and State Council has always attached great importance to the development of the service industry and formulated a series of policies to encourage and support the service industry with remarkable achievements.

The new service format constantly hastens the service sector. In China, the new formats are emerging services directly spawned by technological progress, among them, the rise and development of the mobile Internet is the notable example. The mobile Internet integrates the characteristics both of the mobile communication network and Internet and there are some new services derived from it, including mobile advertising, mobile payment, mobile positioning, and mobile streaming media. Because of some new technologies, especially the continuous integration and penetration of IT and traditional industries, there are many rising service with new technologies and new patterns based on traditional services ,for example, web publishing relying on the Internet to provide publishing services, tele medicine providing long-distance medical treatment , teleeducation for long-distance education, e-commerce for shopping and transaction service and environmental protection services by using energy conservation and clean technologies.

The development of service industries shows the geographical trend. Geographical trend of China's service industry is mainly distributed in the Yangtze River Delta, Pearl River Delta, etc. In 2011, the added value of 16 cities in the Yangtze River Delta is up to 3.8144 trillion, reaching 46.5% of GDP. Among 16 cities, 11 cities in total value added to more than 100 billion. In July 2011, the Jiangsu provincial party committee, the provincial government also specifically introduced On to Further Expedite the Development of Modern Service Industry, to illustrate the general ideas of the development of modern service industry in five years, after 2011. “The Reform and Development Plan of Pearl River Delta of China (2008-2020) requires the Pearl River Delta to build a modern industrial system, giving priority to the main industry group linking modern service industry to advanced manufacturing, forming the high-class industrial structure, industry agglomeration and high-end modern industrial system of the industrial competitiveness. In 2011, in Pearl River Delta, the added value in services throughout the year is up to 2.380846 trillion, accounting for 45.2% of GDP. In accordance with the Plan, by 2012, the proportion of value added in services in the Pearl River Delta will reach 53%, and the index is up to 60% by 2020.

In the process of development of service industries, a number of innovative demonstration enterprises have emerged. In July 2011, the Ministry of Science and Technology released the "12th

Five-Year "Science and Technology Development Plan in China", proposed to expedite the implementation of the support of scientific and technological innovation of the modern service industry and technological innovation, the development of knowledge and technology-intensive service industries, to build a support system connected technological innovation in service industry with the development of industries, which will vigorously promote China's innovation capability of modern service industry. On October 26, 2011, the Ministry of Science and Technology issued one file titled the Notice- First Batch of Modern Service Industry Innovation and Development of model enterprise .It indicates that, in accordance with the Notice - on the Recommendation of Demonstration Enterprises Involved Modern Service Industry Innovation and Development, the Ministry of Science and Technology has identified 49 companies for the first batch of model enterprise in modern service industry ,with the recommendation from the local technology sector. and the experts .

## **2 The Problems of Service-Oriented Enterprise Service Innovation**

For service businesses, continuous service innovation capability is the important driving force to promote enterprise move forward. However, at present, China's service sector enterprises to innovate still exist many problems.

The lack of innovative talent. Many factors affect the development of modern service industry. Among which plenty of creative talent supply are basic conditions. The so-called creative talent is those that have excellent quality, outstanding intellect, and strong will, those that are with a strong sense of innovation and creative spirit, are familiar with the principle of innovation, master innovative approaches and make the performance of innovation in their own innovative thinking and innovative labor in a variety of social practice. But China's service sector enterprises are most lacking the kind of innovative talent at present. The scarcity of Innovative talent results in high dependence of foreign technology. It is difficult to form enterprises' characteristics, which causes a vicious cycle at last.

The lack of innovation in the service-oriented enterprise. Innovation ability determines whether a company has its own place in the highly competitive market and relates to the direct economic benefit and the success or failure of the company. Service innovation is not only the most powerful engine in the company future development but also the core competitiveness of the company. According to a more consistent international view, enterprises whose enterprise research funds account for one percent of the sales are difficult to survive, whose for two percent barely maintain, whose for five percent have a strong competitiveness. But research and development that the majority of service-oriented enterprises in our country put into service innovation are far below the level of developed countries in the world. Services that those enterprises provide are imitated, so the core technology still lies in the hands of imitated large enterprises at home and abroad. Because of a lack of core technologies, services homogenization problem is serious. Therefore, peers have nothing but to compete through the price war.

There is international cooperation on service innovation of service-oriented enterprise. The most prominent manifestation in the Internet age is the increasing international cooperation of innovation in the technological globalization. On one hand, due to the assembling of all mankind wisdom is needed to solve the common problems faced by all mankind and to explore the major issues in the nature; we centralize the huge investment of resources. On the other hand, every country has also recognized that the decisive factor in supporting a country's international competitiveness is to enhance the ability of technological innovation and it has become an inevitable choice for the government and enterprises to join the tide of world science and technology and master the cutting-edge dynamic through international technical cooperation. But as to Chinese service-oriented enterprises, international cooperation is not much during the process of technological innovation by now, neither the national policy guidelines nor the specific practice guide

The infrastructure construction in service-oriented enterprise service innovation is not quite good, especially not having formed a public service platform on service innovation of Produce, Academia and Research. The combination of the three is the core of enterprises' technological innovation also a shortcut to speed up the development of technological innovation. During the process of developing the service industry, focusing on the cooperation of principle parts on various resources, including the collaboration of government, research institutions and universities, which also equips industrial extension ability, and then a complete industrial chain can be formed. From global perspective, the United States, Germany and other countries have achieved great success in the cooperation of produce, academia and research; especially made a significant contribution in promoting national development of SMEs. But in the field of technological innovation of service-oriented enterprises in China, a

foundational, public welfare and opened technological innovation service platform of produce, academia and research has not being universally formed

### 3 Conclusions

We should raise awareness and strengthen organisational leadership and co-ordination. Combing the characteristics of regional economic development, every region should establish the service industry development center or industry management office as soon as possible assuming the duties of development plan, layout adjustments, policy making and coordination of management functions of service industry in the regional economy so as to effectively speed up the development of service industries. Every province should make policies to promote innovation in the service sector: The government should strengthen the exchange of industrial enterprises, service industries and research institutions, establish the tripartite Economic Forum of political, business, academia, strive to explore the problems of economy integration, growth pattern change in service sector, listen to the needs and views of all parties and collaborate the ideological and pace of various parties. Government should coordinate the relationship between service and industrial sectors and strengthen the leadership, define goals and tasks in relevant departments. The government should quantify the medium and long term goals of service industry development gradually, master the specific goals to be completed each year so as to implement the task with decomposition, responsibilities distinction and annual test. The Government should further transform its functions by strengthening macro-control over service industry, making industrial and technological policies and encouraged independent innovation policy measures to create a favorable external environment.

We should implement and promote various incentive policies of innovation, creating an innovative environment. Services should be driven towards healthy and fast track of development. Relevant policies of services development need to be constantly improved within the region. Through the implementation of other incentive policies to prompt the service enterprises to become the main innovation about tax and financial, we should encourage and guide service enterprises to have independent innovation and ensure legitimate interests and good operation of the main services. We need to do the following

- 1) incent service enterprises to implement the policy of innovation and tax cuts
- 2) promote the implementation of government procurement of self-dependent innovation
- 3) encourage the police implementation of manufacturing companies to use the service initiatives
- 4) speed up the rule files' promulgation of intellectual property in service industry.

We should nurture innovation main body and play the role linking the production to dissemination. Service enterprises is the main body of innovation and plays a critical part in connecting with the production and spreading of knowledge .And, to a large extent, the capability and level of innovation in service enterprises have a impact the ability of other innovative subjects in the region. In order to enhance the innovative capacity of the service enterprises, we must make them become real subjects of innovations. Therefore, we should promote service enterprises to gather strength, capital, talent and a variety of innovative elements, making it grow into the main body of decision-making, investment, interests, risk –sharing and regulation of investment efficiency.

We should enhance the serving capabilities and serving performance of service enterprises and we should expand exchanges and cooperation of international and regional business and activate the innovation capability of enterprises. The government has set up a platform to enhance exchanges of domestic counterparts and international peers in service sector and boost close cooperation between universities and research institutions. Our government should support our services enterprises to "go abroad", expand exports of high technology and its products and encourage and support service companies to set up overseas research and development institutions or industrialized base. Increase the efforts for attracting investment and further expand opening up. To expand financing channels by exchange property rights for capital, stock for increment, resources for technology and market for projects. To actively seek World Bank's low interest rate, interest-free loans, fight for listing more projects in state's plan and provincial plan and get national and provincial policy support. The same time, to comprehensively improve the innovation capability of China's service industry our government should set a clear standard in attracting capital and investment and focus on bringing in key developing fields, emerging industries and fields of weakness through transformation, upgrading and driving by leading enterprises. Under the circumstance that the international competitiveness of service industry in China is still relatively weak, while attracting capital and investment, we should take full advantage of

preferential policies for developing countries who assume the obligation in the General Agreement on Trade in Services. First opening up superior branches in service industry, while implement protective policies on weak branches, adhere to the principle of equality, mutual-benefit and progressive liberalization. To promote international development of service industry step by step with limit and focus, China is supposed to make medium and long-term opening up plans to develop various industries.

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# Analysis on Management Organization and Regulation Establishment of Postgraduate Instruction

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**Abstract:** With the increasing demand of postgraduate education in China, management organization and regulation establishment of it has become more and more significant. On the basis of analyzing the current situation and existing problems of management organization and regulation establishment of postgraduate education in China, the paper gives some suggestions, including improving the recruitment and education mechanism of postgraduates, perfecting the selecting ways of tutors and college work, improving the development planning of postgraduate education and construction of tutor team, as well as improving its management system of postgraduate education.

**Key Words:** Postgraduate Education; Management Organization; Management System Game theory

## 1 Introduction

Currently, with the quick development of national economy, people's living standard is continuously improving and the demand for higher education, especially that of postgraduate education is also increasing. Meanwhile, the quality of postgraduate education draws more attention. The management organization and regulation establishment in postgraduate education is the core to guarantee the quality. The cultivation and management of postgraduates, including school organization, system establishment, scientific research, talents development and material construction, is an essential part of university planning. Perfect management organization and regulation establishment is the important means to guarantee postgraduates' quality, push university planning and intensify the quality.

The internal management organization of graduates in present China is the three-level management of the university (graduate school), school and department<sup>[1]</sup>. The graduate education has developed to a new stage rapidly and stably. However, not all the universities and colleges have formed perfect management pattern and operation system. Thus, how to reasonably set up management organization with the principle of capacity, efficiency and optimization as well as how to coordinate and cooperate within two-level or three-level management organization with the principle of the unified position, right and obligation to push the management of postgraduates to perfection and standardization has become an important topic. From the perspectives of management organization and regulation establishment of postgraduate, this paper proposes the related suggestions and counter-measures.

## 2 Present Situation and Problems of Graduate Education

### 2.1 The status quo of management organization and regulation establishment

#### 1)The status quo of graduate management organization

First, establishment of management organization. At present, Chinese high education sets up the management institutions in the levels of the university and the school. Under the level of the university, graduate school is set up, mainly responsible for the recruitment, cultivation, degree and employment of graduates. While, under the level of the school, the related office will be concretely responsible for the teaching and daily management of the graduates. At the same time, some universities and colleges set up the management organization in the level of departments. However, seen from the result, the department level burdens more of the coordination with the school office and does not carry out obvious management.

Second, management organization and operation of graduate education. Currently, the organization and operation of graduate education management mainly are embodied in three aspects: a) establishment of new basic-level organization level, such as the research institute system, relying on the subject and its prominent characteristics and charged by the director. The establishment of the institute system evidently corresponds to the Degree Authorization Center, which promotes the establishment of the Degree Authorization Center fairly well. b) making use of the two-level organization of the university and the school to complete the education management, i.e. to complete the main part of graduate education and management through the school and basic-level and establish a benign interactive mechanism to push the overall development of graduate education. c) the pattern of classified

management in the level of the university, school and Degree Authorization Center. The Degree Authorization Center constructs the discipline quality monitoring mechanism. Through implementation of various regulations, assessment system, performance evaluation and incentive, the quality of the degree can be guaranteed.

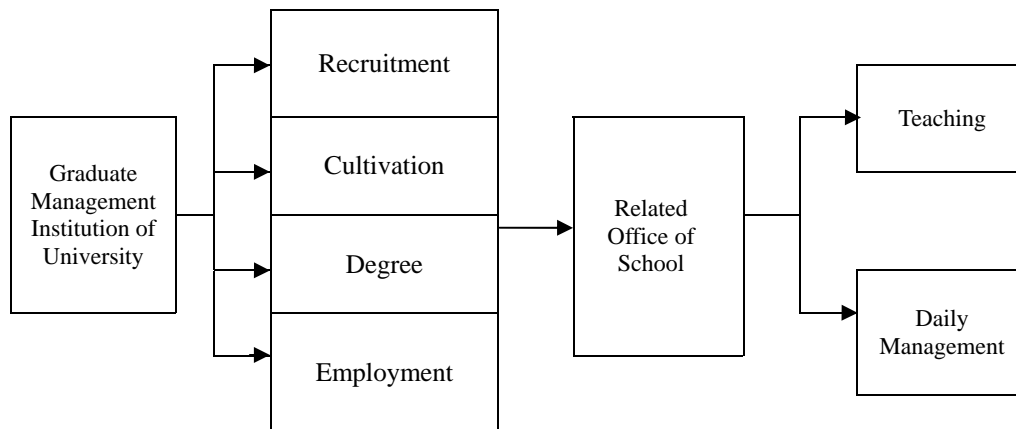


Figure 1

2) the status quo of the graduate education system construction in China

The system construction of Chinese graduate education mainly includes the constructions of the disciplines, courses and the teaching teams.

First, the discipline construction. Currently, the construction and management of the disciplines in most universities adopt the system of “one academic leader in one school”. Meanwhile, many universities also set up the discipline expert committee to guide the discipline construction. The management mode can be summarized as “general arrangement of the university, coordination of the school, responsibility of the person, examination of the concrete item”.

Second, the course construction. At present, course construction of the national graduate education is not so satisfactory. a) The elements of course system have strong trace of the undergraduates. The course contents are largely similar to those of the postgraduates, which is not beneficial to students’ deep research and their interest development. b) The curriculum requirement has the strong tendency of “unification”. c) The course system structure has evident feature of “disciplinization”. d) The course system is not scientific enough.

Third, tutor team construction. Presently, the tutor team needs great improvement. a) The number of the professor is still less whose average age is relatively old and the discipline distribution is uneven, directly affecting the construction of degree authorization center and key disciplines. b) The overall strength of the teacher’s team is not strong. c) The number of degree authorization center is less with unreasonable structure and uneven distribution. d) The condition of degree authorization center and that of the discipline is not perfect.

## 2.2 The problems and enlightenment

As for how to effectively carry out scientific management organization and regulation construction of graduate education, from book<sup>[2]-[5]</sup> in the reference, most scholars hold that:

First, management organization and system construction of graduate education mainly focus on the setting-up of management institutes, establishment of management system as well as the implementation of various related rules and regulations.

Second, management organization and system construction of graduate education is a systematic project and the effects of various policies will be shown after a period of practice, which requires the scientific attitude to direct graduate education in the course of concrete management organization and system construction.

Third, for different colleges and universities, in the course of concrete management organization and system construction of graduate education, there will be some similar problems. However, due to different development level, different school characteristics or different regional environment, no unified patterns of development exist for graduate education. In this sense, different colleges and universities need to make out their respective management system and regulation of graduate education according to their different actual situation.

At present, many scholars in China propose some positive countermeasure toward this issue, but there are still some problems to be solved for certain concrete colleges and universities. (1) Operational organization, system and measures are needed to support the implementation of the measures. (2) It is necessary to borrow the successful experience on the management patterns and regulations of graduate education from other colleges and universities. However, owing to the different history and disciplines of each schools, the borrowing of management patterns must be combined with their real situation to explore a scientific and effective way.

### **3 Countermeasures and Suggestions**

Good operation mechanism is the guarantee of standardized management. Therefore, the operation mechanism in Chinese graduate management organization should concentrate on the sound regulations, rights and standardized procedures<sup>[6]</sup>. The establishment of management regulation is an important guarantee for the smooth realization of management operation and function. Hence, the paper, in view of the above problems, proposes some suggestions as follows:

#### **3.1 Perfection of recruitment and training process of graduate**

In practical terms, the recruitment of graduates, first of all, should be in strict accordance with the national plan of students' proportion and development. Secondly, the different schools should report the scale of graduate development according to the tutor team status and cultivation conditions to the university and it is the university who determines the final number of graduate recruitment with overall balance. Besides, the university should maintain the right of approval and decision in the recruiting process for extra examination of some subjects, abnormal admission, major adjustment and additional admission, etc.

In cultivation issue, first of all, the graduate department of universities and colleges shall be responsible for the plan of training formulation of all the schools and then the schools carry out the concrete cultivation process. Secondly, the independent schools arrange the specialized teaching curriculum, professional foreign language teaching, training and assessment of the teaching ability and practical teaching skills. Again, the university shall keep the approving power of public teaching courses, exempted courses, auditing courses, management of science and research funds and application of science and research fruits, etc.

In addition, as for the registration management of the graduate, first of all, each school should manage the registration, qualification accreditation, all kinds of scholarship of their own graduates and sign them up for school record. Second, the school should keep the approval of the projects like temporary suspension of schooling, resuming of interrupted studies, graduation in advance, delayed graduation, administrative justice, approval to go abroad as well as graduates' marriage, etc.

#### **3.2 Improvement of tutor selection method and the school's daily work**

The selection of tutors should strictly obey the standards of the university and be carried out by the academic degree evaluation committee. Each school is responsible for the training, evaluation and daily management of the tutors.

As for the work of each school, perfect graduate management organization should be set up and full-time and experienced administrative management personnel should be assigned. Besides, the school should allocate certain amount of funds for graduates' management and provide special office space as well as research and test conditions, so as to lay a solid foundation for the efficiency of graduates' management.

#### **3.3 Perfection of development plan and tutor team construction**

First, making a perfect development planning of degree and graduate education is of great significance to guide the graduate education of the university. Meanwhile, it also promotes the discipline establishment and the education development of the university. At present, the Ministry of Education in China has dramatically adjusted the related evaluation index of doctor degree's auditing, who extends the scope of assessment from certain authorized degree center of major to the whole subordinate discipline. This increases the breadth and depth of the assessment. Therefore, the university shall adjust some index in the original planning to make them better in line with the real development trend of the construction.

Second, tutors burden the divine mission and important responsibility in recruitment, cultivation, employment, quality education and training quality of the graduate. The tutor system is beneficial to fulfill the tutors' duties and raise their teaching levels. Therefore, the large-scaled graduate education atmosphere shall be formed by adjusting discipline structure to increase discipline construction, training

and introducing large amount of high-level tutors and related personnel, such as increase of detailed rules of tutor team construction as well as recruiting and training tutor policy, etc.

### **3.4 Further perfecting the management system**

First of all, according to the actual condition of the university, Graduate Study Manual shall be made as the necessary material for teachers and graduates, which includes the codes of conduct in daily management.

Second, for the overall consideration of graduates' management, except for the contents of Graduate Study Materials, the following several aspects can be perfected as regulations to satisfy the future expanding scale of graduates. (1) The making out of work regulations. The management regulations and document management system shall be established according to the national policy. (2) Position obligation shall be set up to guarantee the systematicness and integrity of all the materials about recruitment, cultivation, discipline construction of graduates, etc. which will not be disconnected due to the personnel exchange. (3) Inviting and hiring experts at home and abroad to give academic lectures periodically to realize the institutionalization, standardization and scientification of graduates education management.

Lastly, experience of the leading universities should be actively absorbed and borrowed so as to strengthen the graduate management on the basis of management system construction to promote its faster and better development.

## **4 Conclusion**

By the purpose of graduate education, the management activity is to effectively allocate the personnel and various resources in the system and to determine the relations among them and their forming process. The design of its organization structure should insist the principle of division and coordination of labor, the right corresponding to the obligation and effective communication of information. Besides, the design should also depend on the features of the scale and layers of graduate education. As the expression form of the organization, the set up of graduate management organization needs to obey the related organisational principle. Each subsystem and member in this organization have the common goal, i.e. the standardization of graduate management. To achieve this goal, all the personnels and subsystems in the organization have a clear division of work.

The construction of graduate management does not mean to pursue a new regulation, but put more efforts in strengthening the integrity, connection and completeness of its function so as to establish a set of constraint, standard, incentive and monitoring system as well as to maximize the function. The management system of graduate education mainly covers a series of management documents and regulation of graduate recruitment, identity management, cultivation, degree, tutor management and discipline construction.

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# Shared Value Creation: An Innovative Approach on Women's Enterprise Development

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**Abstract.** A growing number of researches are addressing gender and entrepreneurship exploring women business owners. This paper is exploratory and gives a short overview to provide an understanding on the possible relationship between women's enterprise development and shared value creation. There is still a lack of comprehensive research regarding the combination of the two concepts. Within this frame, the article investigates this approach by highlighting the Women's Empowerment Principles and its goals towards women's advancement. The intention is to outline the topic suggesting the need of further studies and analysis, especially concerning the role that gender can play in entrepreneurship and its impact on societal progress.

**Key words:** Gender; Shared value; Entrepreneurship.

## 1 Introduction

This paper aims to present part of the findings of a doctorate research of which the core objective is to identify a pathway that connects gender and shared value creation, focusing on women's enterprise development. It addresses aspects of the *status quo*, the development and economic opportunities, and future directions of women-owned business by trying to explore its linkage to shared value. Women entrepreneurs are advancing and, to some studies, making a revolution in the business world. Female-owned businesses are growing in a fast pace and have great potential to expand even more their businesses. However, enterprising women encounter gender specific obstacles. This way, in order to overcome them, the Women's Empowerment Principles - WEPs - can be an important vehicle to promote female entrepreneurship.

For the present study, the main attention is on women's enterprise development as a key channel to create shared value. The concept of shared value once applied, can increase multinational corporations' competitiveness by addressing social issues and identifying new areas of growth and profitability. Access to healthcare, poverty relief, nutrition, environmental sustainability, education and rural development are challenges the companies are building sustainable solutions for.

The paper is structured as follows: first an overview about women and entrepreneurship scenario followed by an introduction of the WEPs, and then the introduction of the Shared Value concept. Finally, the combination of gender and shared value creation through the lens of the WEPs focusing on Principle number five which, among other, aims to implement enterprise development and supply chain.

Currently, when talking about women in business and entrepreneurship, is possible to verify that they are publicized and promoted in many different ways. The article will point out some trends and challenges in the field. Nevertheless, there is a lack of comprehensive research regarding the combination of the two concepts and much has to be done to gain knowledge and to advance.

It is important to mention that nowadays there are more systematic data available referring to women's entrepreneurship and gender empowerment in terms of business. However, little is available about shared value, but it is clear that along the elaboration of this work, more essays were probably released. At the same time, until the present moment, we couldn't find any academic text with the gender and shared value creation framework. One might say this is not because it does not happen with frequency, but due to the fact that the concept is on its embryonic phase, at least in terms of documented material.

## 2 Gender and Entrepreneurship: Women's Enterprise Development

The concept *Third Billion* was coined by DeAnne Aguirre and Karim Sabbagh in a 2010 report (Booz & Company apud Ernst Young, 2012) and represents women who are entering the mainstream economy for the first time. Yet to the same source, in spite of all advancement, approximately 860 million women worldwide are not prepared and/or not enabled to take part in the world economy. That means they lack sufficient education and support from their families and communities. The report also

mentions United Nations data, according to which women invest a larger proportion of their income than men in children's education, enabling them to make a greater economic impact in the future.

The emerging acceptance of gender equality as an investment concept has been gaining space in the latest years. Experts state that investing in women is one of the most important strategies to promote sustainable development around the globe. Women's empowerment, if understood as investment concept, can bring long-term value creation and better investment performance (Keefe, 2011).

Entrepreneurship, defined as the resource and process whereby individuals utilize opportunities in the market through the creation of new firms (Naude, 2010), is a relatively new concept. Academic studies about female entrepreneurship concentrate on main themes such as characteristics and motivations of women entrepreneurs, start-up patterns, resources and constraints, management style, finance issues, business networks and business performance and growth (Fenwick, n.d.). Researches investigate differences in the psychological and social background, and the labour market. They draw differences between men and women's characteristics varying from the propensity to start its own firm, lack of business training or experience, leadership style, and barriers such as access to land-ownership and credit.

Enterprising women encounter gender specific obstacles in both developing and developed countries, in spite of their great potential to expand their businesses. A pilot - Women's Economic Opportunity Index, - the first of its kind, was conceived by the Economist Intelligence Unit in order to provide a better understanding of the factors that influence women's economic opportunity and how countries have addressed them. A set of laws, practices, regulations, customs and attitudes that allow women to participate in the workforce under conditions roughly equal to those of men composes the women's economic opportunity, regardless of their being wage-earning employees or business owners (Economist Intelligence Unit, 2010). When it comes to setting up business, women face greater barriers than their male counterparts. Women's enterprises are often small, and may not mature to their full potential, being concentrated in the retail or services sectors. The same source also points out that in some countries women are not allowed to obtain loans, unless with the permission of a man, making evident how much access to credit and property ownership rights differ from country to country. Not being allowed to vote, to own property or venture outside the home without a male family member in some developing countries, as well as being perceived as not well qualified as men to run a business in general, are main barriers for the development of women's enterprise. Increased access to business education, finance, management training, credit, opportunity to land-ownership, among others, are necessary for women to overcome the barriers.

According to Kelley et alli (2011), in 2010 business ventures were started and managed by 104 million women in 59 countries, which represents more than 52% of the world's population and 84% of world GDP. In their respective countries, these female entrepreneurs made up between 1.5 percent and 45.4 percent of the adult female populations. Across those regions, other 83 million women ran businesses they had launched at least three and a half years before. The contribution women make to worldwide entrepreneurship and business ownership can be exemplified by these 187 million together. Overall, entrepreneurs have a critical role to play in fostering innovation and women contribute to entrepreneurship in all economies. According to the same source, there are some key findings about women's entrepreneurship around the globe. The conclusions point that:

1) Women are more likely to believe in the existence of entrepreneurial opportunities if they live in societies in which they perceive themselves as capable for entrepreneurship.

2) Although women are equally likely to see entrepreneurship as attractive, if compared to men, they lack positive attitudes about their own personal capacities or inclinations for starting businesses, besides having less personal contact with entrepreneurs.

3) As an overall trend, women are less likely to venture in entrepreneurship than men; in particular economies it is magnified.

4) In less-developed economies, although women entrepreneurs are more likely than men to be motivated by necessity, the gap may be starting to narrow.

5) In times of economic downturns, necessity-based entrepreneurship may partially fill in employment gaps in developed countries.

6) In early development-stage economies, a key challenge for female entrepreneurs is sustaining their businesses beyond the start-up and early phases.

7) Generally speaking, networks of women entrepreneurs are smaller and less diverse than those of men. Women's personal relationships, particularly family, are more relied upon than other sources.

8) In wealthier economies, although women entrepreneurs tend to be older, as equally educated and

as likely to create innovative products as men, their growth expectations are half those of men.

Moreover, Kelley et alii (2011) state that in order to advance female entrepreneurship it is important to promote societal attitudes toward entrepreneurship (especially women's engagement in entrepreneurship), make opportunities and resources available in order to assist women-run business start-ups, and use technical assistance and education to support women's business growth.

Implementation of legislation is often weak and opportunities, limited, even where this legislation is intended to help women (the Economist Intelligence Unit, 2010). However, as economies develop and opportunities for women expand, attitudes change. Women are now perceived as essential to the expanding labour force in countries with stagnant or slow-growing populations.

### **3 Women's Empowerment Principles**

The Women's Empowerment Principles - WEPs (launched in 2010) - were created to guide on how to empower women in the workplace, marketplace and community. Hence, after adaptation from the Calvert Women's Principle launched in 2004, this set of Principles for businesses was created in collaboration between the United Nations Entity for Gender Equality and the Empowerment of Women (UN Women) and the United Nations Global Compact and aimed at the promotion of gender equality and women's empowerment. The Principles emphasize the business case for corporate action and are subtitled Equality Means Business. They not only seek to inform other stakeholders, including governments, in their engagement with business, but also to be a useful guide for business. In short, according to the Global Compact Network Switzerland and UN Women (n.d), the Principles consist of:

- 1) Establishing high-level corporate leadership for gender equality.
- 2) Treating all women and men fairly at work – respecting and supporting human rights and non-discrimination.
- 3) Ensuring health, safety and well-being of all women and men workers.
- 4) Promoting education, training and professional development for women.
- 5) Implementing enterprise development, supply chain and marketing practices to empower women.
- 6) Promoting equality through community initiatives and advocacy.
- 7) Measuring and publicly reporting on progress in order to achieve gender equality.

For the present paper, the Principle number five will be highlighted for its focus on implementing enterprise development, supply chain, and marketing practices that empower women. This Principle comprises the expansion of business relationships with women-owned firms (including small businesses, and women entrepreneurs); the support of gender-sensitive solutions to credit and lending barriers; having business partners and peers respect the company's commitment to advancing equality and inclusion; the respect for the dignity of women in all marketing and other company materials; and the ensuring that company products, services and facilities are not used from human trafficking and/or labour or sexual exploitation (United Nations Global Compact; UNIFEM, 2010). Among the benefits of this Principle is the stimulation of female entrepreneurship. Section number five, about gender and shared value creation, will highlight a figure about the WEPs and the leading companies in terms of putting the Principles into practice.

### **4 Economic Progress and Societal Needs: Shared Value Creation**

An article outlining a new concept for corporate responsibility was published by Michael Porter and Mark Kramer in 2006. In it, the authors state that there would be considerable potential for organizations to contribute to sustainable global growth if they went beyond compliance and philanthropy to actively look for connections between their activities and the growth and progress of society. This concept was called Creating Shared Value (Nestlé, 2012). Shared value consists of policies and operating practices that enhance the competitiveness of a company while advancing the economic and social conditions of the communities in which it operates. It focuses on identifying and expanding the connections between economic and societal progress using value principles (Porter and Kramer, 2011). To the same source, companies can create shared value in three basic ways:

- By redefining value chains - Companies can act as a steward for essential natural resources and drive economic and social development, while improving the quality, quantity, and reliability of inputs and distribution.
- By reconceiving products and services - While better serving existing markets, accessing new ones, or lowering costs through innovation, businesses can meet social needs.

· By strengthening local clusters - Provided that businesses do not operate in isolation, they need reliable local suppliers, a functioning infrastructure of roads and telecommunications, access to talent, and an effective and predictable legal system in order to compete and thrive.

For the moment, it seems that Nestlé Company has been leading the way in terms of creating shared value initiatives and issuing reports since 2007. The key focus areas are related to nutrition, environmental sustainability and rural development. They stress that engaging with the stakeholders underpins shared value creation, enabling the firm to identify emerging issues and respond to them accordingly, driving performance improvements (Nestlé, 2012a). Some other companies have already started to issue annual reports on shared value related to their core business. Avista (2011) and Nestlé (2012a) are two examples of firms that make use of the pyramid shape to represent their understanding on how to meet societal needs while making profits. The pyramid is divided in three parts, where the basis is compliance, laws, licenses, and codes of conduct. In the middle lies sustainability, and creating shared value is on the top of the pyramid. Moreover, Avista (2011) states that shared value is created when social need, business opportunity and the company's set of corporate assets and expertise intersect:



**Figure 1 Building Shared Value (Avista, 2011).**

Another graphic representation about shared value creation was found on Bockstette and Stamp (n.d). For the authors, shared value creation consists of investments in long-term business competitiveness that also address social and environmental objectives. By incorporating social issues into their core business strategies to benefit both society and their own long-term competitiveness, these companies seek to create shared value.



**Figure 2 Shared Value (Bockstette; Stamp, n.d).**

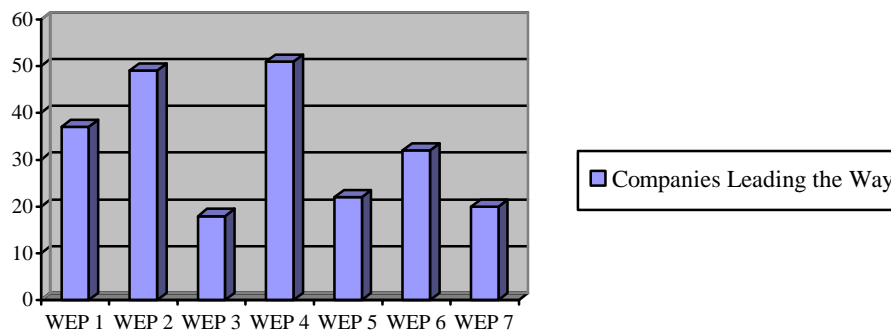
The idea that both business decisions and social policies must follow the principle of shared value is an implication of the mutual dependence between corporations and society. A business will find itself on a dangerous path if it pursues policies that just benefit its own interests at the expense of or the society, and vice-versa. The long-term prosperity for both will be undermined if just a temporary gain to one is sought (Porter and Kramer, 2006).

## 5 Gender and Shared Value Creation

It appears that the intersection between gender and shared value creation happens when one has an understanding on Women's Empowerment Principle number five, which focuses on implementing enterprise development, supply chain and marketing practices that empower women. Through this, one might say that it is possible to achieve shared value creation. Promoting practices and expanding

business relationships with women-owned firms, especially small and medium-sized enterprises - SMEs - and supporting gender-sensitive solution to credit and lending barriers may be a good channel to enhance businesses and create shared value. After the launching of the WEPs in 2010, several companies demonstrated their commitment to the Principles and signed the document expressing their support for advancing equality between women and men. The list of signatories to the CEO Statement of Support for the Women’s Empowerment Principles had 263 companies until February, 2012 (United Nations Global Compact; UN Women, 2012). There are companies already leading the way putting the Principles into practice. According to United Nations Global Compact and UN Women (2011), there are over 90 good practices from companies to empower and advance women. These companies have several programmes in different parts of the world and the programmes vary from companies and region, but they all aim to contribute to the advancement of women’s empowerment around the globe.

The figure below shows how many companies have practices regarding each of the WEPs. The Principle that has the most practices within 93 companies is the number 4 (51 companies or 55% of the total), which promotes education, training and professional development for women. The Principle that has the fewest practices is the number 3 (18 companies or 19% of the total) regarding health, safety and well-being of all women and men workers. The Principle number 5 stays on the 5<sup>th</sup> position. Out of 93 companies, 22 (24%) address the principle having practices to implement enterprise development, supply chain and marketing practices that empower women, whilst 71 don’t. WEPs 1, 2, 6 and 7 are ranked on 3<sup>rd</sup> (40%), 2<sup>nd</sup> (53%), 4<sup>th</sup> (34%), and 6<sup>th</sup> (21, 5%) places respectively. Out of 93 firms, only one has practices with all the WEPs, another has practices with 6 of the WEPs. All the other companies address between one and five of the WEPs.



**Figure 3 Companies Leading the Way and Women’s Empowerment Principles**

One of the barriers towards women-owned firms is their absence in the supply chain of large companies and their lack of financial resources to competitively bid on supply contracts. Some non-profit institutions are working on the matter. For instance, WEConnect International, a corporate led non-profit that connects women business owners globally to facilitate inclusive and sustainable economic growth. In addition, women's business enterprises that are at least 51% owned, managed, and controlled by women are identified, educated, registered and certified by them. WEConnect is connecting women entrepreneurs to its corporate members, which collectively represent billions of dollars in annual purchasing power, therefore expanding opportunities for them. Companies need to be engaged to increasing their relationship with suppliers led by women, driving inclusion throughout their supply chain. These firms leading the way are already promoting gender equality and diversity, equal pay for equal work, providing funding, giving business training, encouraging female entrepreneurship, and strengthening legal awareness, to list some of the initiatives. Likewise, in order to reflect their market and customer base, many multinational corporations have diversified their global supplier base. This not only increases shareholder value, but also enhances their competitive advantage. One can boost local well-being and add to a project’s long term sustainability, building the way to create shared value, by promoting gender equality practices and including local women within the supply chains of international investment projects. Opportunities to create shared value can arise by increasing procurement from firms led by women. By strengthening local clusters and making women-owned firms reliable local suppliers by sharing knowledge, providing financing and specific training, companies can increase quality, avoid certain costs, increase flexibility and foster innovation.

Some studies elsewhere state that the full role of women is untapped and this is the time to unleash

this powerful source of new possibilities. In this context, it is possible to make a parallel with the Blue Ocean Strategy. According to Kim and Mauborgne (2005), red oceans represent the industries in existence today and the blue oceans denote all the industries not in existence today. To the authors, blue oceans are defined by untapped market space, demand creation, and the opportunity for profitable growth. It requires organizations to develop and align the three strategy propositions: value proposition, profit proposition and people proposition. Although the authors do not mention societal needs and demands, one might say that it seems this strategy suits the trends when it comes to gender issues and can go beyond the existing boundaries in a new blue ocean: the gender business ocean. Added to this, lays the possibility of combining the Blue Ocean Strategy and the Shared Value concept, given the fact that the Shared Value concept focuses on the connection between societal and economic progress, and the Blue Ocean Strategy seeks value innovation by focusing in a new and uncontested space.

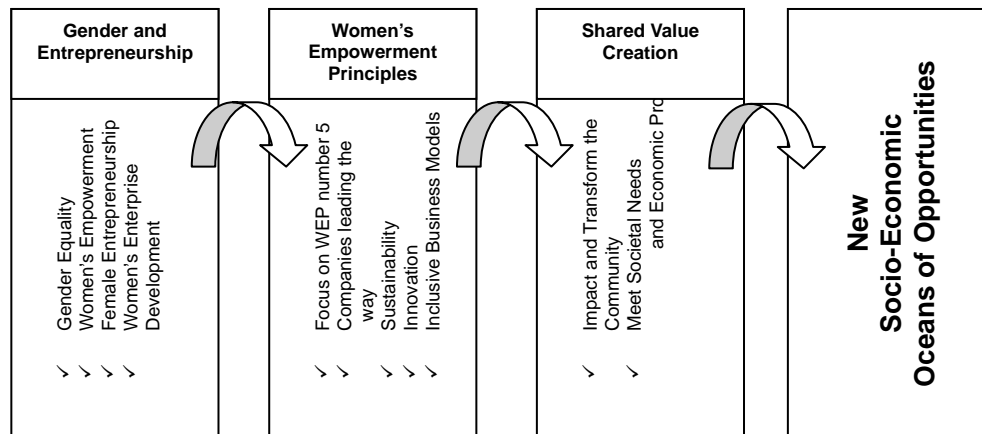


Figure 4 New Socio-Economic Oceans of Opportunities.

## 6 Conclusions

One might say that there is a gender impact on entrepreneurial activities and this can lead to development and economic growth. Although there is still a gap between the potentiality and what happens in the reality, progress has been made towards gender equality. The impact and growth in the share of women’s participation in the economy as entrepreneurs and in corporate life has changed the workplace creating a series of challenges. It is necessary to gain a better knowledge on the impact caused by economic, cultural and social aspects, when it comes to business. Also, to explore the perceptions of entrepreneurs about the difficulties of starting a business, and beliefs about the existent opportunities in the economic scenarios.

If investing in women’s empowerment and gender equality is smart business, and if it is becoming a growing consensus, then it seems that a new blue ocean has been created. To Porter and Kramer (2011), opportunities have been there, but have been overlooked. Holding back half of the population through unequal education, job opportunities and wages does not represent sustainable development. At few times throughout the history, the roles were balanced by having both men and women doing equally important economic activity. Recently, a lot has been said on the importance of balancing the female participation in the economy.

Firms can build a path to their actions towards gender equality and women’s enterprise development. At companies, the implementation of the Women’s Empowerment Principles in different contexts may take some time and different paths to be implemented, depending on the firm’s size, industry, location and corporate culture. It is the moment for companies to start to dialogue with non-traditional partners and ask what their difficulties are, in order to offer products / services that meet their needs. Companies may face challenges on their way to create shared value. Nevertheless, those challenges should not prevent them from pursuing this goal.

Although the leading companies in terms of WEPs practices do not link their outcomes to the WEPs and shared value creation, the author sustains the exploratory idea that, firms which are committed to the Women’s Empowerment Principles are paving their ways to create shared value through the gender perspective. Moreover, when women-owned business gain economic empowerment, access to knowledge and training, access to market and value chains, land and finance, then they can

transform and be agents of changes in the community they are involved in. Developing and investing in women's enterprises as capable suppliers can transform the environment once they become more robust, with higher profits and able to hire more people and pay better wages, invest in training and education, meeting societal needs. Therefore, shared value can be created. The WEPs, particularly Principle number five, can be a strong tool and guidance in helping realize this purpose.

In terms of research, the gender and shared value framework has not been explored and further studies need to be developed. Achieving gender equality and empowerment, encouraging women's enterprise development and creating shared value could be the gateway for numerous social-economic new possibilities for society's challenging environment.

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# Analysis of the Critical Influential Factors on Healthy Development of University Academic: Based on DEMATEL Method

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**Abstract:** From macroscopic and microcosmic levels the paper systematically analyzes the factors that influence the healthy development of universities academic and the relationships among them based on social, economic, cultural, institutional, educational, personal respects and universities themselves. By using the DEMATEL method, it is revealed that the comprehensive effect of influential factors differs in degree quantitatively. The result is that academic standardization and honesty education, academic standards and related laws, the performance appraisal and evaluation system, academic ability training system and other factors are the direct causes of healthy development of academic in universities. While ill general mood of society, mechanism of market economy competition, personal morality are the central issues, the education system itself is the main factor, individual factors in academic healthy development are at the core position.

**Key words:** Universities; Healthy development of academics; Critical factors; DEMATEL method

## 1 Introduction

Academic development is the basic motivation of university consistent innovation. The uniqueness of university lies in that its purpose is not to make profits or to manage but to the development of various academics. Originally, universities are based on academic development and teaching, with the core position of academy. Academy is the logical starting of universities as well as their ending. However, as to the various students and their degrees, they are just the inevitable outcome of this kind of college education. Currently, the university academic matters have always been criticized and been the burning questions of news media. Although they are not new and unique in China, it shows that there have been books about making and distinguishing forgeries in our ancient times and thus came the differentiating the false books' learning. In 1990s, problems about academics have come into being in the American science policy schedule. Max Weber points out: the university students and staff go after reputation, cater to the power unconsciously. The professors consider the scholastic work that they should be committed to as performance. They try their best to demonstrate their values by so-called academic achievement without the influence and effect in the academic development. With the repeated exposure of academic scandals, such similar problems have increased.

Recently, researchers began to keep a watchful eye on it. Many worldwide scholars have researched the problems as fabrication, falsification and plagiarism etc. For the reason and which factors influenced academic development, they have not arrived any agreement. Few people worked on the influential factors specially, no one has systematically done analysis and never before has anyone use this method to talk about it. Most of the researchers just judge the act. Foreign scholars did more exploration in institutional construct terms to solve the problems, while Chinese scholars mainly from the perspective of construction of morality. We should clear up the sources and get to the bottom of problems, suit the remedy to the case, and strengthen governance from the root of it. For this reason, this paper tries to analyze the factors that influence healthy academic development of universities and their relationships with the help of DEMATEL method in the hope of providing the decision-making basis for healthy development of university academics.

## 2 Analysis of the Influential Factors on Healthy Development of University Academic

### 2.1 Macroscopic influential factors

#### 2.1.1 Social circumstance

(1)Social Utilitarianism. As the subsystem of society, universities will be influenced by the social circumstance naturally. The reality that our country has been entering an transformation period determines the coexistence of all kinds of moral values, and shows the tendency of value diversification. Under the above influences, the teachers' values and interests have changed much more obviously than traditional intellectuals. Under the background of the whole society which seeks quick success and



instant benefits, they abandon the tradition “thin gentlemen in profits” and think it is unreasonable and dehumanizing to devotion rather than belittle or give up material benefits. They tend to focus more on the unity of devotion, development and the corresponding material treatment. Under the current circumstances that there is a close link between academic achievement and financial benefits, social status as well as professional title and post, people engage in academic development with the outstanding purpose and are driven from the point of Utilitarianism view. Some of scholars put academic research and individual material benefits together closely to go after the maximum of personal profits and disregard academic development and advancement.

(2) Adverse social atmosphere. Under the influence of adverse social atmosphere, such as the lack of responsibility and integrity, currently, the atmosphere in academic circles is still worrying. There are some bad points such as: plagiarizing others academic achievement, improper means to obtain competitive research funding and a variety of academic awards, academic journals for the collection of high fee for publication to ignore the strict academic quality, manuscript, low-level repetition, academic faction, for academic resources to form the exchange of interests group and so on. The lack of sense of responsibility, integrity and lack of consciousness of adverse social impact exist in the current academic circles.

#### 2.1.2 Economic factors

(1) The introduction of Market economy competition mechanism. With the establishment of our socialist market economy system, competitive status and competitive consciousness get rich soil and enormous power. The competition inside or among universities has been very fierce. University ranking and evaluation which led to Matthew effect in the competing for sources, make universities try to increase research quantity and link research up with title, treatment or graduation, which results in distortion of some scholars' individual values

(2) The drive of economic benefits. The economic benefits drive influences academic development mainly in the following point: some people fight for research funding only focusing on immediate results of short-term projects, they take the engagement in scholarly activities as the means of acquisition of personal fame, but not to go after the academic development. Under the drives of real interests, such as evaluation of title and subject, first title for superior and so on, academic research and academic achievement rise constantly in the quantity but in quality on the decline, which leads to the bubble of academic research

#### 2.1.3 Cultural factors

(1) The influence of historical culture. China has the tradition of "the government is closely linked to the schools, and has a monopoly of them". That is to say school is the political appendage, as the government monopoly. In addition, the modern university as an exotic thing, the foundation of university autonomy is not firm, and the freedom of academy is faint. The pragmatism tendency of traditional intellectuals "to secure safe and fortune for the people, to establish peace for all the future generations", "a good scholar will make an official " and traditional idea of "official standard" lead to the imbalance between university administrative power and academic power, which is deeply influencing the academic development.

(2) The influence of mass culture. Under the market economy system, mass culture has become quickly to a new force and expanded to the mainstream one. What it pursues is the popularization and rapidity, and what it discards is the original creativity and individuality. The traditional academic standardization and the current mass culture combined with each other. Thus, some people do not take the academic individuality and innovation as the aim but an increased amount of accumulation which cannot promote the academic quality improvement.

#### 2.1.4 Institutional reasons

(1) The academic standard and related legal system. In academic circles, we lack of an authoritative academic standard text. Although some academic institutions developed their own academic norms, there exists many problems in the academic authority, systematicness and rationality, and there is no corresponding academic activity norms. As for the norms of academic behavior legal construction, there also has the loophole, lacking of strict laws and regulations and weak enforcement, which results in low cost of academic behavior of violation and repeated academic behavior.

(2) The academic supervision and evaluation system. At present the special supervision mechanism of academic conduct is in the blank state in China. There is lacking of academic criticism and public opinion supervision. In the academic evaluation standards, we have not established the agreeable authentic ones, and we pay too much attention to academic carrier level and scientific research but despise teaching. As well as academic review procedure transparency also defects. In the academic

evaluation system, we tend to put much more emphasis on the quantity than quality. Some poor academic behaviors can only be found through reports, and generally solved in the unit itself. In the project approval, awards and other academic evaluation activities, we fail to establish the leading role of professional association of experts in the academic evaluation.

(3)The influence of management system. In China, the relations between universities and the superior competent department is of leader and administrative subordinating member and of supplying and being supplied. The administrative departments, which are in charge of universities, increasingly have a hand in university affairs by controlling all kinds of limited resources. Universities must rely on various kinds of quantitative indicators among college competition, to get the resources. Therefore, the academic and research activities have been influenced by the superior department. Thus, on the one hand, academic power is dominated by administrative power, on the other hand, academic freedom is destroyed, all of which affected the academic development.

## **2.2 Microscopic influential factors**

### **2.2.1 Educational factors**

(1)The marketization and massification of higher education. The marketization of higher education make the competition among colleges fierce, which results in some of the colleges "academic drift" and "academic great leap forward". Therefore, it is full of a large number of low level repetition in the academic achievement. Higher education popularity led to lower quality, such as the level of university education is like it in high school, the education of postgraduate undergraduatize, which affects the healthy development of university academic.

(2)Lacking in the education of academic standardization and academic integrity. Generally speaking, universities neglect of guiding the students in academic norm of behavior, lack of the education of students' moral and honesty, which lead to these students now — potential scholars are indifferent to the intellectual property concept, lack of academic standard understanding, and don't indicated others research results while citing .

(3)The effect of academic ability training system academic ability training system effect of academic ability training system. The academic training for students is relatively deficient, and there is not a complete set of mature academic ability training system. As Sun Zhengyu said," a lot of people engaged in academic research, are still lacking of formal, systematic, rigorous academic training, still do not have indispensable concept system, background knowledge, research methods and academic self consciousness of academic research, as well as have not yet achieved on learning ' and ' knowledge ' identity".

### **2.2.2 Individual factors in academic activities**

(1)Personal academic capability. The absence of personal academic quality is an important factor. Academic research is an steadily accumulative, successive process. Some people can't promote the advancement of learning because of the absence of their own academic quality, such as knowledge structure, research methods and so on.

(2)Personal moral quality. Some people's moral quality is low and their sense of discipline is rather weak, they take part in academic activities unwillingly and they look for quick success, doing things by irregular ways, which distorts academic true motive.

### **2.2.3 The factors lies in universities**

(1)The consciousness of academic management in Universities. University internal management shows the duality of academic one and administrative one. Currently, internal academic management and administrative management is mixed, responsibilities of academic management are not clear, administrative management generalizes, which lead to the academic administrative change and the weak consciousness of academic management.

(2)University research performance management and evaluation system. At present, many universities in our country are explicitly required numbers of published papers and publications on the level when the graduates want to get the degree or a diploma. In students or teachers assessment and in the advance and superiorly commenting, universities give different value calculation according to the numbers and level of publications. University teachers' evaluation of professional titles, they mainly rely on scientific research projects, research results. In university scientific research incentive, there exists the tendency of linking academic together with money, power and reputation. Thus, it doesn't encourage academic development but leads to the alienation of academic. Therefore, the students, who do not have academic literacy to graduate, put all sorts of things together in papers to increase score, and teachers focus on scientific research but despise teaching, and they are busy in project, topics and papers.

### 3 Analysis on the Relationship among the Factors on Healthy Development of University Academic

According to the analysis above, the following Table 2 can summarize and show the influential factors of university academic development. But the factors are not isolated from each other but perplexing. For example: on the one hand, the individual academic quality has been vulnerable to some social evils, and has been influenced by academic monitoring and evaluation, higher education massification and marketization, academic standardization and academic integrity education and academic ability training system. And on the other hand, individual academic quality influences the academic supervision and evaluation as well as social atmosphere. We should combine present situation of academic development, by investigation and fully discussion in order to determine the relationships among various factors. Thus, we formed the relationships among the factors which influence healthy development of university academic. It is shown in the Table 1. If the factor “i” has effects on j(i≠j), in the table 1, line ij column the value is 1, whereas the value is 0. As the academic standard and academic integrity education have the impacts on the supervision and evaluation, in the corresponding position, the value is 1, it has no effect on the management system, the corresponding position, it is 0.

**Table 1 The Direct Influence Matrix of University Academic Healthy Development**

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0
2	1	0	1	1	0	1	0	1	0	0	0	0	1	1	0	0
3	1	1	0	1	1	1	0	0	0	1	0	0	0	0	0	1
4	1	1	0	0	0	0	0	0	0	1	0	0	0	1	0	1
5	1	1	1	0	0	1	0	0	1	0	0	0	0	1	1	0
6	0	1	0	0	1	0	0	1	0	1	0	0	0	1	0	0
7	0	1	0	1	0	0	0	1	0	0	1	1	1	0	0	0
8	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	1
9	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	1
10	0	0	1	1	1	1	0	0	1	0	0	1	1	0	1	0
11	1	1	0	0	0	0	0	1	0	1	0	1	1	1	0	0
12	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0
13	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
14	1	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0
15	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1
16	0	0	1	1	0	0	0	1	1	0	0	0	1	1	1	0

According to the analysis above, the various factors of the academic healthy development influence one another, and directly or indirectly have an influence on the healthy development. In the academic development process, it is difficult to determine which factors influence much more than others. Therefore, with the help of DEMATEL, we build an analyzing model of the key points of academic healthy development, in order to analyze the degree of various factors on academic healthy development and the important degree at academic health development process.

**Table 2**

The Factors that Influencing Healthy Development of University Academic

society	1.social utilitarianism	2.adverse social atmosphere	
economy	3.market economy competition mechanism	4.drive of economic benefits	
culture	5.historical culture	6.mass culture	
institution	7.academic standard and related legal system	8.academic supervision and evaluation system	9.management system

education	10.marketization and massification of higher education	11.education of academic standardization and academic integrity	12. academic ability training system
individual	13.personal academic capability	14.personal moral quality	
colleges&universities	15.consciousness of academic management	16.research performance management and evaluation system	

## 4 Analysis on the Model of the Critical Influential Factors on Healthy Development of University Academic

### 4.1 Constructing the comprehensive-influence matrix of the various factors

According to the relationship of the above factors, with the help of DEMATEL, we analyze the comprehensive effect of each index and the effect of each index on academic healthy development, so as to identify the key factors of university academic healthy development. The DEMATEL method, namely Decision-Making and Trial Evaluation Laboratory, is proposed by American scholars by using graph theory and the tool of matrix for systematic analysis. That is to say, we can analyze systematically the logical relation of every factor and direct influence relation matrix. So we can calculate the influence degree and the influence degree of every factor for other factors, so as to calculate each factor's "prominence" and "relation". Based on the method, the steps of constructing the model of academic healthy development are described as follows:

Step 1, for academic healthy development, we adopt the system diagnosis method to determine the affecting factors, then take the "healthy development of university academic" as the overall factors. If it is set to F1, F2, ... in this paper, Fn, n=16.

Step 2, to analyze the relationship among the factors. That is to say, we analyze whether the factors have direct relations with each other or not, to invite experts to discuss the relationships among the influencing factors of the academic healthy development .

Step 3, to establish direct-influence Matrix Y. The matrix represents direct relationship of each index. The 16 assessment factors will generate the direct-influence matrix of 16 x 16 sizes. And if the factor "i" in matrix has a direct influence on factor j, the value of  $Y_{ij}=1(i \neq j)$ , if the factor of "i" had no direct impact on factor "j",  $Y_{ij}=0$ . in addition, when  $i=j$ ,  $Y_{ij}=0$ .

Step 4, normalizing the direct-influence Matrix Y. In order to analyze the indirect influence among factors, we need normalize the direct-influence Matrix Y, i.e. get the Max, that is the maximum value of the sum of each element in matrix Y , we can get the normalized Matrix  $X=Y/Max$ .

Step 5, to establish the total-relation Matrix T. after get the normalized Matrix X, by the formula of  $T=X(E-X)^{-1}$  we can get the total-relation Matrix T, where E is an identity matrix.The fifth step, to establish the influence relationship matrix T. Obtaining the standardized matrix X, by the formula of  $T=X(E-X)^{-1}$  can be drawn from the total influence relationship matrix T, where E is the unit matrix.

Step 6, to analyze influencing factors. Take the element  $T_{ij}$  in T for example, for each element we can calculate the influence degree, the influenced degree, the "prominence" and the "relation". The sum of the elements in every row of matrix T represents the comprehensive-effect that factor i gives to the other factors, which is called the influence degree. The sum of the elements in each column of matrix T represents the influenced degree that factor i is influenced by the other factors. The sum of rows and the sum of columns are separately denoted as vector D and vector R. The horizontal axis vector(D + R), named "Prominence", is made by adding D to R, which represents the importance of the factor. Similarly, the vertical axis(D-R), named "Relation", is formed by subtracting D from R which may divide factors into a causal group and an effect group. Based on the above statements, the factor belongs to the causal group if (D-R) is positive, it means that the factor has a greater effect on the other factors. And the factor belongs to the effect group when (D-R) is negative, that is the factor which is affected more by others .

Through the calculation, according to the influence degree and influenced degree, we can judge the degree of each factor to a university academic development. According to "prominence", we can judge the important degree of every factor in the development of college academic health system. We can also analyze the relationship of every factor in accordance with the "prominence". Therefore, according to the table1 which shows a direct relationship between each factor, we can calculate the comprehensive influence matrix of influencing impact on colleges academic healthy development, then get the influencing degree, "prominence" and "relation" of factors on the academic healthy development as

shown in Table 3.

**Table 3 The Total-Relation Matrix (×100)**

NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Sum(D)	Promin- -ence	relation
1	21.10	39.33	32.34	31.68	31.33	33.91	1.74	13.93	8.05	13.28	0.22	1.90	14.51	33.90	8.05	11.76	297.04	600.54	-6.46
2	30.11	28.84	30.07	31.14	18.55	31.48	3.31	26.50	6.21	12.41	0.41	2.02	27.24	31.88	6.21	12.52	298.91	756.82	-159.00
3	32.25	40.21	24.26	34.39	33.37	35.17	2.12	16.96	12.01	25.76	0.26	3.52	17.41	25.52	12.01	24.95	340.19	682.76	-2.38
4	27.13	32.38	19.43	18.96	16.45	18.21	1.55	12.43	8.29	20.63	0.19	2.80	15.07	29.63	8.29	20.92	252.37	583.26	-78.55
5	31.62	39.18	34.83	21.21	24.03	34.65	2.03	16.21	21.80	14.09	0.25	2.05	15.21	33.43	21.80	14.48	326.86	647.82	5.90
6	14.96	32.58	17.28	15.49	26.57	17.32	2.93	23.48	7.91	19.80	0.37	2.89	14.81	27.40	7.91	9.01	240.70	564.69	-83.29
7	12.88	31.63	11.00	23.84	8.13	10.87	3.35	26.76	3.50	7.77	12.92	15.50	27.76	15.55	3.50	8.58	223.54	273.96	173.12
8	7.95	25.44	9.39	11.07	5.92	7.87	14.01	12.07	3.96	4.26	1.75	2.50	23.45	10.01	3.96	17.56	161.16	464.50	-142.18
9	12.16	17.73	26.59	13.30	25.74	13.13	2.83	22.68	10.06	9.32	0.35	1.56	11.53	13.53	21.17	24.22	225.91	391.21	60.16
10	17.27	25.68	31.05	28.26	32.41	30.13	2.15	17.18	23.12	14.10	0.27	14.57	26.22	20.49	23.12	15.34	321.37	531.57	111.17
11	27.45	36.35	18.32	18.22	16.00	18.58	3.45	27.63	6.56	20.27	0.43	15.52	30.45	30.28	6.56	9.66	285.74	304.54	266.94
12	5.68	10.77	5.90	6.08	5.08	5.91	2.27	18.16	1.68	2.48	0.28	0.63	19.51	17.33	1.68	4.19	107.62	180.05	35.19
13	4.76	19.28	4.93	5.28	3.06	4.92	2.17	17.32	1.27	2.08	0.27	0.56	6.34	5.24	1.27	3.76	82.51	394.49	-229.47
14	32.74	41.48	32.89	32.27	31.67	34.46	1.98	15.85	8.19	13.51	0.25	1.97	26.32	23.38	8.19	12.18	317.32	674.12	-39.48
15	9.61	13.29	15.20	11.39	24.98	11.70	1.28	10.25	21.96	18.66	0.16	2.51	9.90	11.86	10.85	21.21	194.80	360.10	29.50
16	15.82	23.73	29.09	28.33	17.65	15.68	3.24	25.94	20.72	11.78	0.41	1.93	26.25	27.39	20.72	15.60	284.28	510.21	58.35
Sum(R)	303.50	457.91	342.57	330.92	320.96	323.99	50.42	303.34	165.30	210.20	18.80	72.43	311.98	356.80	165.30	225.93	~	~	~

#### 4.2 Analysis of results

First of all, according to the “relation” of various factors, we can divide the academic development of health impact factors into two groups. One is the causal factor. As shown in the table, the sequence of causal degree is academic norms and honesty education, academic standards and related laws, the popularization of higher education and marketization, management system, performance assessment and evaluation system in Universities, academic ability training system and so on. These factors are the direct reasons of influencing college academic health development. The other is effect factor. According to the large to small order of the absolute value, the sequence is individual academic quality, social evils, academic monitoring and evaluation, mass culture and economic benefits and so on. These factors are affected by the causal factors, thus they indirectly have an effect on universities' academic healthy development. Thus we can strengthen the individual academic quality cultivation from the source. According to Table 3, with the value number of each row's sum from the largest to the smallest, we can know that mechanism of market economy competition, historical culture, higher education massification and marketization, the individual morality accomplishment, adverse social utilitarianism moral, the education of academic standardization and honesty, college performance appraisal and quantity evaluation system have much more influence on other factors. Under the existing environment, which can not temporarily change, we can strengthen the personal moral quality training, the education of academic standardization and honesty, college performance appraisal and quantity evaluation system to improve and promote the healthy development of university academic.

According to the “prominence” of various factors, from the largest one to the smallest, the sequence is the adverse social atmosphere, mechanism of market economy competition, personal morality, historical culture, utilitarianism social moral and economic benefits, these factors are the keys to the university academic healthy development and indicate that currently academic status is worrying. It is the priority to purify the social atmosphere and improve personal moral qualities to promote academic healthy development.

In the light of the following aspects : society, economy, culture, education, institution, individual, universities, and the factors belong to them, we can get another group of sum of “prominence” and “relation”. We will grasp the various factors on the academic healthy development as a whole. It is shown in Table 4.

**Table 4**

various factors	influence degree	“prominence”	“relation”
Society	595.95	1357.36	-165.46
economy	592.56	1266.05	-80.93
culture	567.56	1212.51	-77.39
institution	610.61	1129.67	91.55
education	714.73	1016.16	413.3
individual	399.83	1068.61	-268.95
Colleges & universities	479.08	870.31	87.85

From Table 4, we know that education plays the largest role in university academic healthy development process, followed by institutional factors. From number of the “prominence”, make a comparison among the microcosmic effects such as education, individuals and universities, it is shown that individual factors is at the core position in academic healthy development. Seen from the “relation”, the value of education, institution and university is positive, which explains that they play active roles on promoting academic healthy development, and they are main driving factors in the academic healthy development. We should promote university academic healthy development from these aspects.

## 5 Conclusion

The healthy development of university academic is influenced by many factors. This paper analyzed the influencing factors as for the healthy development of university academic from seven aspects-- the society, economy, culture, education, institution, individual and university itself. By using the DEMATEL method, it reveals quantitatively comprehensive effect degree among factors and its “relation” and “prominence”. It also reveals the essential problems of the academic healthy development are adverse social atmosphere, mechanism of market economy competition, personal morality, historical culture, the utilitarianism moral and economic interest drive and so on. Through the overall analysis of the above seven aspects, we conclude that the education itself is the key influential factor in academic healthy development, and individuals are in the core status in the academic healthy development. Education, institution and university is the key driving factor in academic healthy development. For the sake of healthy development of academic, we should do further research about improving academic quality and academic morality through education. It is necessary to explore further the perfection of the related system.

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# Performance Evaluation of Budget Management System Based on AHP

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**Abstract:** Performance Evaluation of Budget Management is a key part of the entire process in the budget with a connecting role. This article determines the weight on Performance Evaluation system of Budget Management on the basis of AHP to provide support and assistance for companies. The study found it has considerable desirability and can truly reflect the level of performance.

**Keywords:** AHP; Budget management; Performance evaluation

## 1 Introduction

Budget management is constituted by a series of budget activities. The budget activities are interrelated and influence each other to form an interdependent whole. As a management tool and method, budget management through reasonable distribution business people, financial, material and other strategic resources to help enterprises achieve the established strategic objectives, and with the appropriate performance management with to monitor implementation progress of strategic goals, control Expenses, and forecast demand for funds, profits, and final financial status.

The theory on budget shows the entire process of budget management contains budget preparation, budget implementation, budget control, budget analysis, budget evaluation and so on. Among them, Performance Evaluation of Budget Management is a key part of the entire process in the budget, with a connecting role<sup>[1]</sup>. At present, the mature methods on performance evaluation, including Cluster Analysis, Fuzzy Evaluation, Gray Evaluation, Analytic Hierarchy Process and so on<sup>[2]</sup>. Among them, AHP have been widely used to determine the weights. Analytic Hierarchy Process, a popular decision method software used for making multi-criteria decisions, invented by Professor Saaty in 1970. In this paper, we design performance evaluation of Budget Management System on AHP.

## 2 The selection on Performance Evaluation of Budget Management system

Currently, the performance evaluation index system of state-owned enterprises should reflect the "central management of enterprise performance evaluation of Interim Measures" and the implementation details, because "the central management of enterprise performance evaluation of Interim Measures" and its implementation rules include a detailed performance evaluation system, and corporate management as the basis for the relevant assessment. However, the Enterprise Group for internal management needs, evaluation mechanisms should be constructed to adapt to the characteristics of budget management Group management performance evaluation system to improve the objectivity and impartiality. In the budget management performance appraisal, pay attention to the combination of a variety of evaluation, namely, when considering the quantitative indicators of qualitative indicators, evaluation indicators need to combine absolute and relative indicators, targets can not ignore local concerns the overall objective. According to the indicators of general settings [3]. we believe that the Performance Evaluation of Budget Management should be composed of three parts, namely, the Basic indicators, Auxiliary indicators and Modification indicators. Detailed in Table I.

Performance evaluation indicators in the budget management system, the basic indicators (operating margin, net cash rate of operating profit, return on investment, asset turnover, asset-liability ratio and rate of sales growth) is the business goals and development strategies; auxiliary indicators (rate of product qualification, cost margins, current ratio and rate of cash inflow from operating activities) is the extension of basic indicators in the process of business activities; modification indicators (rate of residual income and rate of market share) is a key element of strategic complement to the basic indicators on the impact of objective factors correction.

## 3 The Basic principles on Analytic Hierarchy Process

Analytic Hierarchy Process is a combination of qualitative and quantitative analysis on multi-objective decision methods. AHP hierarchical complex problems, according to the properties of the problem and the goal, be broken down into different components and in accordance with the

inter-related factors will be combined according to different levels together to form a multi-Level of analysis model.

According to the characteristics and basic principles, the comparative analysis of each layer factors, the introduction of 1 to 9 ratio scaling method to determine the matrix, by solving the largest Eigen value and the eigenvector of the matrix to get the relative weight of each factor, finally, calculating the value of each bottom index relative to the highest level to get the weight order of each program. AHP determines the weight as the following steps: first, the establishment of hierarchical structure model; second, structural matrix; third, the consistency test. Among them, the matrix is the relative importance of each index value. Structure Paired comparison matrix by comparison and 1 to 9 ratio scale system.

The consistency test is on the basis of normalizing the matrix, calculating eigenvectors and the largest Eigen values.

After calculation, if the test passed, then the feature vector is the weight vector; if not passed the inspection, you need re-construct comparison matrix.

## 4 Determine the Weight on Performance Evaluation system of Budget Management based on AHP

### 4.1 Establish hierarchy model

Performance Evaluation system of Budget Management is composed of Target layer, Sub-goal layer and Index layer. Detailed in Table 1.

### 4.2 Structure matrix (paired comparison matrix) and the consistency test

We structure Matrix (paired comparison matrix) through visiting and survey the large enterprise groups which using budget management, and inviting the relevant experts comparing the relative importance of the assignment.

Detailed in Table 2, Table 3, Table 4, Table 5, Table 6.

## 5 Conclusion

From the allocation weights on Performance Evaluation system of Budget Management, Determine Performance Evaluation system of Budget Management based on AHP is in line with the principles of our building, which is based on maximizing profits, taking the basic development strategy of the enterprise into account. AHP can improve enterprise performance evaluation indicators `s reasonable, reducing unreasonable passing phenomenon, reducing communication and coordination costs of the enterprise. In short, the performance evaluation of budget management is not entirely on the responsible units or individuals to evaluate the performance, and its deeper purpose is to effectively promote the responsible unit and individual behavior, and guide enterprises all employees towards the goal of enterprise in the overall budget. Therefore, the design of budget management performance evaluation regime, managers must keep the enterprise's strategic objectives and overall budget management system work closely together, so as to guarantee the realization of business strategy.

**Table 1 Performance Evaluation System of Budget Management**

Target layer	Sub-goal layer	Index layer	The meaning of indicators
Performance Evaluation system of Budget Management B	Basic indicators B1	Net cash rate of operating profit B11	Net cash flow from operating activities/ Operating profit
		Asset-liability ratio B12	Total liabilities / Total assets
		Return on investment B13	Annual profit / Total investment
		Operating margin B14	Operating profit / Revenue
		Asset Turnover B15	Operating income / total assets
		Rate of Sales Growth B16	Current sales / Previous sales
	Auxiliary indicators B2	Rate of Product qualification B21	number of qualified products / total number of products
		Current Ratio B22	Current assets / Current liabilities
		Rate of Cash inflow from operating activities B23	Operating cash inflow / Net cash flow from operating activities



		Cost margins B24	Total profit / total cost
	Modification indicators B3	Rate of Market share B31	Product sales / total product market
		Rate of residual income B32	Residual income / operating income

**Table 2 B-Bi Matrix**

B	B1	B2	B3	Weight
B1	1	5	7	0.5713
B2	1/5	1	3	0.2567
B3	1/7	1/3	1	0.1720

$\lambda_{max} \approx 3.0000$  CR  $\approx 0.000 < 0.1$ , Through the consistency test

**Table 3 B1-B1i Matrix**

B1	B11	B12	B13	B14	B15	B16	Weight
B11	1	3	1/2	5	2	5	0.2251
B12	1/3	1	1/2	3	1/2	1/3	0.1411
B13	2	2	1	4	5	3	0.2327
B14	1/5	1/3	1/4	1	2	1	0.1235
B15	1/2	2	1/5	1/2	1	2	0.1411
B16	1/5	3	1/3	1	1/2	1	0.1365

$\lambda_{max} \approx 6.1479$  CR  $\approx 0.0238 < 0.1$ , Through the consistency test

**Table 4 B2-B2i Matrix**

B	B21	B22	B23	B24	Weight
B21	1	1/3	1/5	1/2	0.1637
B22	3	1	1/3	4	0.2699
B23	5	3	1	6	0.4027
B24	2	4	1/6	1	0.1637

$\lambda_{max} \approx 4.0200$  CR  $\approx 0.0075 < 0.1$ , Through the consistency test

**Table 5 B3-B3i Matrix**

B	B31	B32	Weight
B31	1	2	0.5498
B32	1/2	1	0.4502

$\lambda_{max} \approx 2.0000$  CR  $\approx 0.000 < 0.1$ , Through the consistency test

**Table 6 The Allocation Weights**

Target layer	Sub-goal layer		Index layer		Total Weight	Weight order
Performance Evaluation System of Budget Management B	B1	0.5713	B11	0.2251	0.1268	2
			B12	0.1411	0.0806	3
			B13	0.2327	0.1329	1
			B14	0.1235	0.0706	6
			B15	0.1411	0.0806	3
			B16	0.1365	0.0780	5

	B2	0.2567	B21	0.1637	0.0420	11
			B22	0.2699	0.0693	10
			B23	0.4027	0.1034	7
			B24	0.1637	0.0420	11
	B3	0.1720	B31	0.5498	0.0946	8
			B32	0.4502	0.0775	9

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## The Influence of External Search Strategies on the Innovative Performance of Brazilian Firms

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**Abstract:** In this paper we attempt to analyse the influence of three dimensions of external search strategies on the innovative performance of Brazilian firms. The dimensions analysed were: external search breadth, external search depth which deal with how firms access external knowledge and the types of external innovation partners that emphasize the “with whom” to interact. The underlying findings are mainly derived and based on conclusive descriptive research that utilized a survey as an instrument of data collection. In relation to external search breadth the results suggest that the variety of external actors produces a positive impact on the innovative performance of Brazilian firms. As regards external search depth a curvilinear relationship was observed –taking an inverted U-shape–. The empirical analysis also indicated that there was a difference in the impact of different external actors on the innovative performance of Brazilian firms, only customers and/or users and suppliers presenting significant impact.

**Key words:** External search depth; External search breadth; External innovation partners; Innovative performance

### 1 Introduction

The development of the theory of the firm from the neo-Schumpeterian perspective points to innovation as the fundamental element in explaining development and the generation of sustainable competitive advantage (NELSON, WINTER, 1982; DOSI, 1982; DIERICKX, COOL, 1989; TEECE *et al.*, 1997). In this sense, Chesbrough (2003) proposes the utilization of the term open innovation to refer to the inclusion of innovation as the strategic variable in the business model and whose function is to create and capture value for the firm. In this approach the process of innovation is, above all, fed by the internal and external flow of knowledge and technology and, accordingly, dependent on the interaction of the company with external actors. It should be pointed out that the interaction with external actors throughout the innovation process is a question that has been debated for some time in the academic community (VON HIPPEL, 1988; NELSON, 1993).

In general, Child *et al.* (2005) suggests that there are a great number of motivations for the company to interact with external actors throughout its innovation process, ultimately all these motivations culminating in an increase in competitiveness and profitability. Nevertheless, there exists also a series of barriers that can diminish the effectiveness of an interactive innovation process, such as asymmetrical power relations, asymmetrical learning and cultural aspects, among others (HLADIK, 1988; HAMEL, 1991).

Keeping in view the motivations and barriers to companies interacting with external actors throughout their innovation process, it becomes important to analyse the external search strategy, which Laursen and Salter (2006) define as the use of external actors to achieve and sustain innovation. In analysing the external search strategy, Katila and Ahuja (2002) investigate the relevance of analysing deeply the intensity of the interaction with external actors (External search depth) and the diversity of the actors with which the company interacts (External search breadth). Belderbos *et al.* (2004) and Miotti and Sachwald (2003) on the other hand highlight the importance of the choice of which external actors to interact with. Thus, in this paper we analysed the impact of these three dimensions of external search strategy on the innovative performance of Brazilian firms. Therefore, we sought empirical evidence for the relationship between external search strategies and the innovative performance of Brazilian firms.

In addition to this introduction, the paper is structured into four topics of theoretical review, the first covering innovation process models and the importance of external search strategy, the second external search breadth, the third external search depth and the fourth the external innovation partners. Following this, the descriptive analysis of the variables analysed is presented, as well as the analysis of the impact of the three dimensions analysed on the innovative performance of Brazilian firms. Finally,

in the conclusion, a discussion of the main results is given.

## 2 Conceptual Background

### 2.1 Innovation process and external search strategy

Authors such as Van de Ven *et al.* (1999) and Tidd *et al.* (2008) have maintained that innovation should be understood as a process, that is, as the sequence of events interconnected by causal relationships. The first innovation models proposed, that arose in the 40s, have become known as linear models and treated innovation as a linear sequence of activities, in other words, the development of innovations followed a rigid and sequential trajectory – basic research, applied research, development, production and launch of the product on the market - (GODIN, 2006; TIDD, *et al.*, 2008; SVETINA, PRODAN, 2008).

More recently non-linear or interactive innovation process models have been proposed (TIGRE, 2006; TIDD, *et al.*, 2008), which, in general, try to emphasize, above all, the relationship between the stages, the effects of feedback and the relationship with external actors throughout the process. In this sense, Leonard-Borton (1995), Keil (2002) and Chesbrough (2003) emphasize the use of external knowledge in the success of the innovation process. Kline and Rosenberg (1986) on the other hand state that the interactions of the firm with external actors and the relationships between the stages of the process can follow not only one, but various paths.

Thus, in analysing non-linear or interactive innovation process models it is observed that the strategy of external search for external ideas, knowledge and technologies assumes great importance (KATILA, AHUJA, 2002). The external search strategy can be defined as the set of decisions that the firm takes in relation to the manner of best exploiting external knowledge (LAURSEN, SALTER, 2006). In this sense, Chesbrough (2003) suggests that the adoption of an open innovation model necessarily involves the implementation of an external search strategy.

It is stressed that the external search strategy adopted by the firm is influenced by the characteristics of the external environment, such as, for example, the availability of technology, the degree of complexity and turbulence, the framework of the national innovation system, formal mechanisms of transfer, among others. Moreover, Laursen and Salter (2006) propose that the external search strategy is influenced by the past experiences and future expectations of the managers.

In addition to these factors, the effectiveness of the external search strategy depends on how the company manages the search processes for new combinations of ideas, knowledge and technologies. In this sense four capabilities are singled out that need to be developed by the companies. The first is the ability to work with different external actors (LUNDVALL, 1992; von HIPPEL, 1988). The second refers to the ability to build relationships and absorb and assimilate external knowledge (COHEN, LEVINTHAL, 1990). The third refers to the ability to understand the routines, standards and habits of how different external actors work (BROWN, DUGUID, 2000). And the fourth consists in the ability to build up networks of contacts and social capital (HAGEDOORN, DUYSTERS, 2002; POWELL *et al.*, 1996).

From the foregoing, Levinthal and March (1993) point out that it is difficult for organizations to determine what is the best external search strategy. Moreover, empirical evidence is observed that the best external search strategy varies in accordance with the firm's sector of activity, with the type of knowledge sought and with the type of innovation - incremental or radical - (CRISCUOLO *et al.* 2011; KÖHLER *et al.*, 2009). Nevertheless, companies that succeed in developing an effective external search strategy succeed in differentiating themselves and thus generating sustainable competitive advantages. Hence the importance of going deeper into the study of the variables that affect it.

In this sense Katila and Ahuja (2002) propose two dimensions to be analysed in developing an external search strategy. The first consists of the deepness or intensity of the interaction with the external actors (External search depth). The second dimension is the diversity of actors with which the company interacts (External search breadth). In addition, Miotti and Sachwald (2003) and Belderbos *et al.* (2004) highlight a third dimension, the choice of which external actors to interact with. These three dimensions constitute the focus of this paper, while the impact of the external search strategy on the innovative performance is analysed within the Brazilian context. In the topics that follow, conceptual and empirical aspects of these three dimensions are dealt with.

### 2.2 External search breadth

Laursen and Salter (2006) explore the necessity of the firm to analyse its external search strategy with the intention of making possible the absorption of new ideas, knowledge and technologies and thus

making the innovation process more effective. One of the dimensions of analysis proposed for the external search strategy refers to the diversity of external actors with which the firm interacts (External search breadth). Katila and Ahuja (2002) make a point of this being the dimension of the external search strategy utilized by companies to explore new knowledge or access new solutions.

In a rapid review of the literature on the subject, it was found that there is a positive relation between the diversity of external actors that participate in the innovation process and the innovative performance (KATILA, AHUJA, 2002). As explanatory factors for this relationship the following are singled out: *i.* the enrichment of internal knowledge and the creation of new combinations that make it possible for the firm to deal with the problems identified (MARCH, 1991) and *ii.* the increase in the capacity of the firm to recombine internal knowledge, making possible the appearance of new products (FLEMING, SORENSON, 2001).

Nevertheless, Katila and Ahuja (2002) also argue that the interaction with a great number of external actors may cause a negative impact on the innovation process. This is because there exists a cost in the integration of knowledge that may from certain point on offset the benefit of the discovery of new knowledge. In this sense, Henderson and Clark (1990) stress that the interaction with each external actor demands changes in the form of communicating and also in the contacts network. In addition to this, the difficulty that companies encounter in responding to new information in the correct way and thus assimilating it into their innovation process is also pointed out. From this perspective, the interaction with external actors tends to present a saturation point, after which the entry of more actors produces a negative impact on innovative performance. Chen *et al.* (2008) calculate this saturation point at between 8 and 9 external actors in their analysis of Chinese companies.

Uniting the cases of positive and negative effects, empirical studies (LAURSEN, SALTER, 2006; LEIPONEN, HELFAT, 2010) have concluded that the diversity of external actors with which the firm interacts presents a curvilinear relationship (taking an inverted U-shape) with innovative performance. As, however, in this paper only 5 external actors were analysed, it is expected that the diversity of external actors (External search breadth) is positively related to the innovative performance of Brazilian firms. Accordingly, the hypothesis 1 can be stated as:

**Hypothesis 1.** *External search breadth has a positive effect on innovative performance of Brazilians firms.*

### 2.3 External search depth

The diversity of external actors with which the firm interacts has proved to be an important dimension of external search strategy. However, the external search strategy is not based only on finding the external actors that have knowledge, it is also important to analyse the interaction process with them. In this sense, the analysis of the depth of the interaction with each external actor (*External search depth*) becomes relevant. Katila and Ahuja (2002) suggests that this is the dimension of the external search strategy that makes it possible for the company to exploit the knowledge of the external actors with which it interacts in different ways.

Levinthal and March (1981) expand this analysis and conclude that the utilization of the same elements of knowledge intensively reduces the possibility of errors and facilitates the development of routines, which adds reliability to the process. In this context, the repeated utilization of knowledge gained from the external actors can lead to an understanding of the concepts that it involves, and help the company to adapt or expand its competencies (KATILA, AHUJA, 2002). Further, Eisenhard and Tabrizi (1995) describe that the depth of the interaction with external actors makes possible the decomposition of activities linked to innovation in a logical and well demarcated sequence, facilitating the elimination of dispensable stages, in this way associating dynamism to the process.

Nevertheless, Dosi (1988) suggests that there is a limit to the process of deepening of the interaction with the external actors. In this sense, Katila and Ahuja (2002) highlight two factors. The first refers to the existence of a point after which the innovation process based on the same knowledge becomes expensive, while the solutions to its problems become excessively complex. The second is connected to the fact of the deepening of the interaction with external actors making the innovation process more rigid, and thus the entrance of new knowledge less flexible (ARGYRIS, SCHON, 1978).

In this sense, Katila and Ahuja (2002) and Laursen and Salter (2006) propose that innovative performance will be positively affected in principle, but, after a certain point, greater deepening of the interaction with external actors generates a negative impact in innovative performance. Based on these authors hypothesis 2 has been framed:

**Hypothesis 2.** *External search depth is curvilinear (taking an inverted U-shape) related to innovative performance of Brazilian firms.*

## 2.4 External innovation partners

In this section we have tried to describe the specific contributions of five external actors in the sense of helping companies to attain superior performance in their innovation process. It should be pointed out that the five external actors selected were those analysed by the Industrial Research of Technological Innovation (PINTEC), carried out by the Brazilian Institute of Geography and Statistics (IBGE) relative to the period 2008 (IBGE, 2010). They are: customers and/or users, competitors, firms within the holding, suppliers and universities and research institutes.

In general the customers and/or users constitute an external source of information about technologies, user's needs and market characteristics. In the specific analysis of the innovation process, interaction with the customers and/or users tends to speed up the process and also reduce the risk associated with the introduction of a new product or service in the market (von HIPPEL, 1988). Close contact with this actor can also make him an inventor or co-developer, principally in the initial phase of projects related to radical innovations, helping in the introduction of new concepts for the development of prototypes or of complex products (TETHER, 2002; LETTL *et al.*, 2006). In addition, von Hippel (1986) highlights the necessity of identifying and interacting with the lead users, which can be defined as users whose present needs can become the general need of the market in the future.

As well as the customers and/or users, the suppliers can also contribute to speeding up the innovation process, reduce costs, improve the quality of the product or service and, consequently, generate competitive advantages (CLARK, 1989; DYER, 1996; RAGATZ *et al.*, 1997). It should be mentioned that interaction with suppliers, also called vertical cooperation, was extensively analysed in the context of supply chain management. Concerning the innovation process, Bidault *et al.* (1988) stress the benefits of the involvement of suppliers in the initial stages of the innovation process, more specifically in relation to conceptualization and design. In addition, Handfield *et al.* (1999) highlight the possibility of accessing the technological roadmap of the supplier and the greater facility and flexibility in integrating technological changes by means of longer term interaction with the suppliers. On the other hand, Mikkola and Larsen (2006) highlight a substantial increase in the risk of the competitor having access to the knowledge developed.

Concerning the interaction with universities and research institutes, this is seen to be an important external actor for accessing new scientific and technological knowledge and also, understanding new scientific developments (KLEVORICK *et al.*, 1995; BELDERBOS *et al.*, 2004). Based on this information Belderbos *et al.* (2004) highlights the fact that interaction with universities and research institutes tends to facilitate the process of the development of radical innovations.

In relation to the Brazilian context, Benedetti and Torkomian (2009) suggest that in the interaction between universities and research institutes and companies, although the main objectives of the parties diverge, there is a complementarity of the objectives and capacities with the characteristic of co-development. This is because the result desired by the universities and research institutes serves, with great frequency, as input for the company to reach the results planned. Nevertheless, Segatto-Mendes (2001) suggests that the existence of divergent interests and the information asymmetry between the parties tends to generate an agency cost, while it demands the utilization of monitoring and control mechanisms which itself tends to jeopardize the interaction.

In addition to the customers and/or users, suppliers and universities and research institutes, Chesbrough (2003) argues that ideas, knowledge and technologies can be found in companies of all sizes. In this sense, interaction with firms within the holding is presented as an important external source in obtaining superior performance in the innovation process. Cooperation in R&D is held to be one of the principal mechanisms for the company to succeed in increasing its innovation process by means of the recombination of its own resources with the complementary resources of other actors (TEECE, 1986; MITCHELL, SINGH, 1992).

Prominence is given to the fact that companies can also interact with their competitors to learn more about the technology and mainly to reduce costs and risks in large projects and seek solutions to common technological problems, to the extent that they possess complementary R&D resources (TETHER, 2002; MIOTTI, SACHWALD, 2003). However, it can be seen that interaction with competitors tends to be limited to a few situations, such as those cited above, due to the fact that the inherent risk is significantly high. In the Brazilian context, Leão (2005) highlights the relevance of the Theory of Coopetition in understanding the dynamic of interaction among competitor companies.

Based on the foregoing, it was possible to observe the specific factors inherent to interaction with each of the five external actors throughout the innovation process. Thus, it is proposed in this paper that there is a heterogeneity in the impact of different external actors in innovative performance, as outlined

by Belderbos *et al.* (2004), and a reply was sought to the following question:

**Question:** *Which types of external innovation partners have a positive effect on the innovative performance of Brazilian firms?*

The following presents the method adopted for measuring the impact of the three dimensions of external search strategy on the innovative performance of Brazilian firms. Subsequently the results obtained are presented and discussed.

### 3 Data and Methodology

With the intention of replying to the guiding question of this paper, a work of a conclusive descriptive nature was carried out, which according to Malhotra (2006) proves adequate when one possesses *a priori* knowledge of the problem investigated and seeks to describe the existence of relationships between variables. To this end, the quantitative approach was chosen utilizing a survey as an instrument of data collection.

In the first place, a prior test was performed with 3 specialists of the area and 2 companies to analyse the conformity of the instrument of data collection, some alterations being made with a view to simplifying understanding, and in addition two new questions were included. Subsequently, the survey was undertaken during the period July to September 2011, the questionnaire being applied in person when possible and by e-mail to an available database. At the end of this period 72 valid questionnaires were collected for companies operating in Brazil, filled out by executives from the Research and Development areas and Planning.

The survey prepared possesses three parts. The first covers descriptive information about the companies, such as invoicing and investment in R&D. The second seeks to map the inbound and outbound of knowledge and technology throughout the stages of the innovation process. And the third presents a series of questions focused on the problem of this paper, covering: *i. Types of external innovation partners; ii. External search breadth; iii. External search depth; iv. Innovative performance.* In this part of the survey the Likert scale of seven points was used. In topic 3.1 the operationalization of each of the variables examined in this paper is presented.

The data collected were then analysed using the software: SPSS (Statistical Package for the Social Sciences). Univariate and multivariate statistical techniques were utilized, among them the analysis of central tendency measures and dispersion and multiple regression. It is stressed that linear and curvilinear models were tested with a view to verifying which presents a better fit in the Brazilian context.

As already pointed out the sample utilized in this survey consists of 72 companies that operate in Brazil. Concerning revenue 43% of the companies invoice over R\$ 1 billion, 21% between R\$ 100 million and R\$ 1 billion, 29% below R\$ 100 million and 7% did not provide information on revenue. In relation to shareholding control, it is observed that 53% of the companies are Brazilian owned, 39% have foreign capital, 4% are state-owned Brazilian companies and 4% did not reply.

In relation to the approximate percentage of the 2010 revenue invested in R&D and innovation, for the 56 companies that replied an average rate of investment of 4.57% was obtained, 50% of these companies investing up to 2%. On the other hand concerning the percentage of the revenue arising out of the innovation process carried out over the last 3 years, for the 47 companies that replied, an average of 16.58%, was obtained, the revenue brought about by the innovation process over the last 3 years for 50% of these companies being below 10%.

#### 3.1 Measures

##### *Types of external innovation partners*

The question of the external actors was tackled through questions relative to the interaction of the company with each of the five external actors analysed in its innovation process. The following external actors were analysed separately: customers and/or users, competitors, firms within the holding, suppliers and universities and research institutes, whose importance in the process of innovation was stressed in topic 2.4. For these indicators the Likert scale of 7 points was utilized, 1 being “I disagree totally” and 7 “I agree totally”. Cronbach’s alpha for these five external sources is 0.615, which indicates internal consistency and adequate reliability of the questionnaire. On the occasion of the regression analysis we chose to use the binary scale, so that values of 1 to 4 were codified as 0 and values of 5 to 7 were codified as 1, as Leiponen and Helfat (2010) propose.

##### *External search breadth*

The Breadth variable represents one of the dimensions of the external search strategy. This

indicator was operationalized in accordance with the works of Laursen and Salter (2006) and Chen *et al.* (2008). Thus, it was chosen to codify the interaction with the 5 external actors using a binary scale, values of 1 to 4 on the Likert scale being codified as 0 and values of 5 to 7 as 1. Following that the results obtained for each of the 5 external actors were summed. The firms present Breadth equal to 0 when they do not possess a consolidated relationship with any of the 5 external actors analysed, and present Breadth equal to 5 when they possess a consolidated relationship with the five external actors. Accordingly, the greater the value for the variable Breadth the greater will be the diversity of partners with which the company interacts during its innovation process.

*External search depth*

The Depth variable also represents one of the dimensions of the external search strategy and refers to the intensity of the interaction with the 5 external actors analysed in aggregate. This variable was operationalized as the average of the interaction with the 5 external actors measured on a Likert scale of 7 points, as Chen *et al.* (2008) proposes. Higher values for this variable indicate that the firm possesses an intense relationship with a larger number of external actors, indicating that it exploits the knowledge of the external actors with which it interacts in greater depth, a question dealt with in section 2.3.

*Innovative performance*

The measurement of innovative performance was theoretically based on the work undertaken by Griffin (1993), Rindfleisch and Moorman (2001) and Knudsen and Mortensen (2011), which utilize development cycle time measures in the place of financial measures, which permits the comparison between different innovation processes, even when the companies analysed are active in different sectors. The following dimensions were analysed: *i.* superior quality of the product or service generated; *ii.* greater speed of the innovation process; *iii.* less cost of the innovation process. It must be pointed out that these three dimensions were compared with the average of the market in which the company is active. For operationalization of these indicators the Likert scale of 7 points was utilized that goes from 1 “I disagree totally” to 7 “I agree totally”. Cronbach’s alpha for these three variables is 0.660, which indicates internal consistency and adequate reliability of the questionnaire. In the regression analysis we chose to use the average of these three variables to represent the innovative performance of Brazilian firms.

**4 Results**

**4.1 Descriptive statistics**

Based on the sample of 72 large Brazilian companies we sought to explore the impact of the Breadth and Depth variables and of each of the 5 external actors on the innovative performance of Brazilian firms. Table 1 presents the descriptive statistics of each of the variables. It should be pointed out that before these analyses were effected, 5 companies of the sample were excluded due to the fact that they had a high percentage of missing values, which could cause some type of bias in the research.

**Table 1 Descriptive Statistics**

	No. of firms	Mean	S.D.	Minimum	Maximum
Breadth	67	2.70	1.21	0	5
Depth	67	4.02	1.10	1.2	6.8
Innovative performance	67	4.38	1.32	1	6.33
Customers and/or users	61	3.92	1.74	1	7
Suppliers	60	4.94	1.68	1	7
Universities and research institutes	64	4.72	2.02	1	7
Firms within the holding	67	4.43	1.74	1	7
Competitors	67	1.98	1.46	1	7

In relation to the Breadth variable it was observed that Brazilian companies on average present a deeper relationship with 2 to 3 external actors to provide support for their innovation process. It was observed that only 5 companies analysed noted that they had a deep relationship with the 5 external actors and 12 companies with 4 external actors. It should be pointed out that Chen *et al.* (2008), in analysing 10 potential external partners of Chinese companies observed that on average these companies present a deep relationship with 7 external actors.

For the Depth variable this has an average of 4.02, a result that demonstrates that in general



Brazilian companies present a moderate and not very intensive relationship when analysing the five external actors in aggregate. It can be seen also that on average the relationship of the Brazilian companies is more intense with suppliers, university and research institutes and with firms within the holding. On the other hand, the lower intensity of the relationship with customers and/or users should be pointed out and the low intensity with competitors, illustrated by the low average of the study. In relation to the innovative performance variable a middling performance of Brazilian companies is observed on average in relation to the speed, to the cost of the innovation process, and to the quality of the product or service provided.

#### 4.2 Results of the regression analysis

In the first place the correlations are presented between the variables that are to make up the regression analysis. As can be seen there is a positive and strong correlation between the variables Breadth, Depth and the innovative performance. Nevertheless, the correlation between the variables Breadth and Depth is very strong, which could cause problems of multicollinearity in the regression analysis. In this sense, we chose to analyse the impact of these variables on innovative performance separately.

**Table 2 Correlations**

	1	2	3
1. Breadth	1		
2. Depth	0.856*	1	
3. Innovative performance	0.510*	0.570*	1

\*Correlation is significant at the 0.01 level (2-tailed)

Table 3 presents the results of the impact of the variables Breadth and Depth and of the 5 external actors on the innovative performance of Brazilian firms. In models 1 and 3 the linear and positive relationship between the variables Breadth and Depth and innovative performance is tested. In models 2 and 4 the curvilinear relationship (taking an inverted U-shape) between these variables is tested, to identify the existence or not of "over-search". In Model 5 we try to identify which external actors have a significant impact on the innovative performance of Brazilian firms.

**Table 3 Determinants of Innovative Performance in Brazilian Firms**

	Model 1	Model 2	Model 3	Model 4	Model 5
Breadth	0.559*** (0.117)	0.857* (0.479)			
Breadth <sup>2</sup>		-0.054 (0.085)			
Depth			0.683*** (0.122)	1.890*** (0.714)	
Depth <sup>2</sup>				-0.143* (0.083)	
Customers and/or users					0.734** (0.296)
Suppliers					0.770** (0.350)
Universities and research institutes					0.455 (0.300)
Firms within the holding					0.487 (0.323)
Competitors					0.301 (0.437)
Number of observations	67	67	67	67	67
R-squared	26%	26.4%	32.5%	35.5%	27.2%
F-test (sig.)	22.793	11.499	31.337	17.605	4.569

Notes: Standard error between brackets

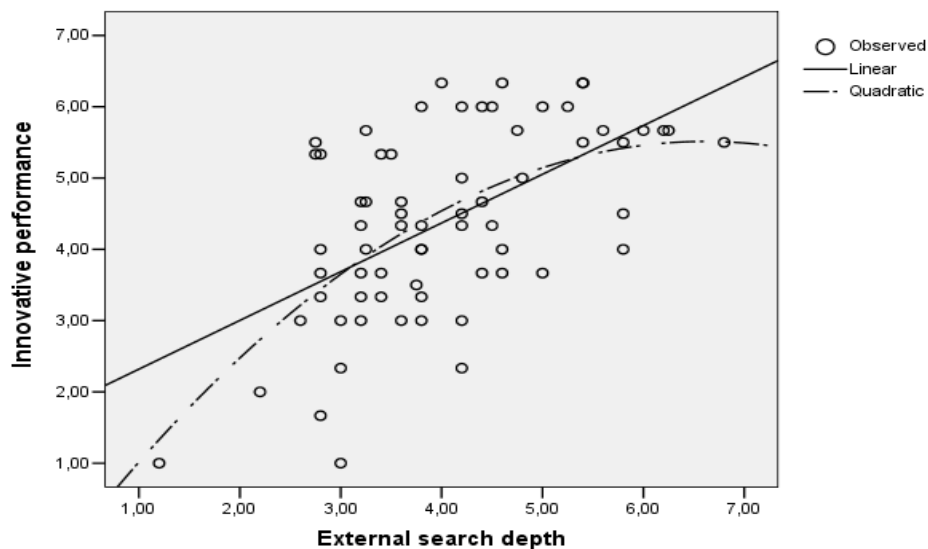
\*\*\* $p < 0.001$ ; \*\*  $p < 0.05$ ; \*  $P < 0.10$

Model 1 shows that the variable Breadth presents a positive and significant impact on the innovative performance of Brazilian firms, confirming hypothesis 1. In this sense, it is observed that an external search strategy that involves a greater variety of external actors tends to result in better performance in the innovation process.

In Model 2 we sought, by means of the inclusion of the square of the Breadth variable, to analyse if there exists an optimum point after which work with a greater variety of external actors starts to cause a negative impact on the innovative performance (taking an inverted U-shape). This resulted in the coefficient of the square of the Breadth variable presenting a negative sign, which would indicate a tendency to fall after the optimum point, nevertheless this coefficient is not significant. Such a result demonstrates that the variety (Breadth) of external actors is a relevant factor in explaining innovative performance and that in analysing 5 sources of knowledge a point of inflection was not observed after which Brazilian companies would present a decrease in their innovative performance in relating to one more external actor.

It should be stressed that this result differs from that obtained by Chen *et al.* (2008) for Chinese companies, as these start to present a negative return in interacting with more than 9 external actors. The work of Laursen and Salter (2006) demonstrated that UK companies present a decreasing return after the point of interaction with 11 external actors. As only 5 external actors were analysed in this paper it was already expected that the existence of “over-search” for the Breadth variable would not be observed.

Model 3 shows that the Depth variable presents a positive and significant effect on innovative performance. Such a result demonstrates that a strategy that seeks to deepen the relationship with external actors tends to increase innovative performance. In complementary fashion, in Model 4 hypothesis 2 is tested, that there is a point beyond which it is not more advantageous for the company to intensify the relationship with its external partners. The coefficient for the square of the Depth variable was negative and significant. Consequently, the curvilinear Model presents better fit in the Brazilian context considering the 5 external actors analysed, which indicates the existence of “over-search” in the Brazilian context when the variable Depth is analysed. This implies that there is a point, in this survey between 5 and 6 (see Figure 1), beyond which the company, in deepening its relationship with more external actors, starts to present a negative return. In practical terms, we have that the strategy that seeks to deepen interaction with the 5 external actors analysed has a saturation point.



**Figure 1 Predicted Relationship Between Innovative Performance and External Search Depth**

In Model 5 we sought to identify which of the 5 external actors analysed presented a positive and significant impact on the innovative performance of Brazilian firms. As a result it was observed that the interaction of Brazilian firms with actors of their value chain, namely: their customers and/or users and suppliers, presented a positive and significant impact on innovative performance. It must be stressed that although Brazilian firms demonstrate a high average for their relationship with universities and research institutes and with firms within the holding, these two external actors were not statistically significant in

explaining innovative performance, as neither were competitors.

## 5 Conclusion

The more recently proposed non-linear or interactive innovation process models emphasize the necessity of firms to interact with external actors in the search for ideas, knowledge and technologies that help to increase the innovation process, either accelerating the process, reducing the cost or improving the quality of the product or service. From this perspective, Katila and Ahuja (2002) highlight the importance of formulating an external search strategy which makes the interaction process with the external actors throughout the innovation process more effective.

It has therefore been our aim in this paper to analyse the influence of three dimensions of external search strategy on the innovative performance of Brazilian firms. The following dimensions were analysed: external search breadth, external search depth which deals with how firms access external knowledge, and the types of external innovation partners that emphasize whom they interact with. In relation to external search breadth and external search depth the results suggest that the variety and depth of the interaction with external actors presents a positive impact on the innovative performance of Brazilian firms, as found by Katila and Ahuja (2002) and Laursen and Salter (2006).

Also examined in this paper was the existence of “over-search”, that is, a point beyond which an increase in the diversity and depth of the interaction with external actors starts to affect the innovative performance negatively as Katila and Ahuja (2002) and Laursen and Salter (2006) suggest. In relation to the external search breadth the presence of “over-search” was not observed. It should be pointed out that this result was expected since only 5 external actors were analysed, they being: customers and/or users, competitors, firms within the holding, suppliers and universities and research institutes. This result indicates that Brazilian companies tend to succeed in improving their innovative performance by the interaction with these 5 actors. Nevertheless the interaction with additional actors, like virtual community and of technologically based start-ups can result in the generation of counterproductive results beyond a certain point, in that it becomes more complicated for the firm to internalize and integrate all the ideas, knowledge and technologies in its innovation process.

In relation to external search depth the hypothesis was corroborated that there is a point beyond which “over-search” is observed. This indicates that Brazilian companies that exploit in depth the interaction with the 5 external actors tend to display inferior results to the companies that exploit in depth the interaction with less external actors. This indicates that the decision to deepen the interaction with a determined external actor should be pondered through an analysis of the associated costs and benefits. In this sense, Almirall and Casadesus-Masanell (2010) highlight that interaction with external actors throughout the innovation process should be analysed in terms of the trade-off between the benefit of the discovery and the cost of the divergence.

The empirical analysis also indicated that there is a difference in the impact of different external actors on the innovative performance of Brazilian firms, corroborating the heterogeneity among the external sources proposed by Belderbos *et al.* (2004). In addition, the results demonstrated that learning in Brazilian companies is more associated with learning by doing and learning by using, than with learning by searching. This is because the external actors that present a significant impact on innovative performance are the suppliers and the customers and/or users, universities and research institutes showing no significant result.

According to Bittencourt (2012), this means that the learning typically utilized by Brazilian companies comes from the accrual of knowledge obtained from firms’ production routines and search processes not associated with codified knowledge. It is pointed out that the learning mechanisms used to a greater degree by Brazilian firms tend to change in accordance with the sector of activity, technology intensive sectors being more attuned to learning by searching.

In general the results obtained demonstrate that open innovation practices, more specifically the interaction with external actors throughout the innovation process, are found within the context of large Brazilian companies. Which according to Chesbrough (2003) indicates greater ability of these in exploring external opportunities and attaining greater innovative performance. In addition to this, it is observed that a large part of the companies can increase the diversity and depth of interaction with the external actors, and should take the presence of “over-search” into consideration when formulating their external search strategy.

As a limitation of the work special mention should be made of the reduced size of the sample, although significant, which reduced the force of the statistical analyses and made it impossible to

undertake sectoral analyses, as well as testing other variables that influenced the formulation of external search strategy.

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# Innovative Research of Physical Education Management Based on the Integrative Teaching Ideology

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**Abstract:** Campus sports competition is not only a platform to show the students' athletic ability and to spread sport culture, but also an important way to improve the students' enthusiasm to participate in sports activities actively. Management reform and innovation to improve the quality of teaching and promote students' health has become urgent to carry out. By using the literature, interviews and logical analysis, this paper proposes the innovative method for physical education management. The author does the research from three aspects: physical education, sports competition platform building and campus sports talents' training. Based on the three aspects, this paper builds up in and outside classroom teaching and managing model and concludes that the campus physical education could be improved by adopting utilitarian teaching ideas so as to increase students' physical fitness and health standards.

**Key words:** Integrative education ideology; Physical education management; Reform; Innovation

## 1 Introduction

There are more than 80 articles related to the integrative education ideology on CNKI. By reading these articles, these articles can be roughly divided into the following categories: The first category focuses on the theoretical study such as the meaning, the status quo, teaching evaluation, system constitution, teaching mode constitution of the integrative education ideology.

The second category pays more attention to practical research. Through teaching experiments and surveys, they discuss the curriculum setting, the use of venues and equipment, student learning effect assessment, management model constitution and so on. They aim at discovering the problems exist in physical education and dealing with them through practice.

The concept of the integrative education ideology is proposed by the sport club teaching mode of United States. In Russia, the study of school extra-curricular physical activity model began with Soviet Union National Board approved establishing the Children's physical training club in 1990. In 1913, University of Michigan and Ohio University set up a special organization to manage the sports extracurricular activities. In Germany, the study of extracurricular sports activity pattern focused on the sports club inside and outside the school. Japan formed two types of sports club early after the war. One is compulsory sports club and the other is liberal sports club. The ultimate goal is developing the autonomy and creative ability of students with the teacher's help.

To summarize, the research of the integrative education ideology has a long history. Predecessors have also done a lot of scientific research to verify the correctness and rationality of the integrative education ideology of Physical Education. Most of the studies mentioned the concept of the life-long sports and people le-centered concept. But we found that few study is related to classroom teaching management and extracurricular fitness activities. In other words, there is a lack of studies about how to innovate in teaching management and how to establish an incentive mechanism.

## 2 The Theoretical Basis of Management Innovation in Physical Education Activities

### 2.1 Instilling education utility in campus sports and enhancing students' sense of happiness

The utilitarian thought is always accompanied by the development of education. In 19<sup>th</sup> century, the British utilitarianism educators set sense of happiness as the aim of education and treat the individual experience of happiness as the long-lasting intrinsic motivation of education.<sup>[1]</sup> This is worth re-interpretation the content of China's educational value and meaning. Combined with China's series measure of physical education reform in recent years, such as "sunshine sports activity", "club teaching method", we may see that students' initiative, enthusiasm and personalized training have been

emphasized and students' personal sense of happiness has been put in the first place.

But we have to admit that if education utility was emphasized excessively, some negative effects could appear because training fatigue and exercise performance appear simultaneously and are indivisible. Thus educators should combine education utility with practice and emphasize students' sense of accomplishment and utility so as to stimulate students' intrinsic motives of physical exercise.

## **2.2 Theory of achievement motivation**

Psychologists have done researches about learning motivation from various aspects. Zhang Chengfen points out that Target, as a motivation incentive, usually triggered a motivation when people realize its value and draws the conclusion that achievement goal is an important trigger of learning motivation.<sup>[2]</sup> In the current school physical education, in-class teaching is always the most important teaching points while extracurricular activities are always out of touch. In this case, it is difficult for students to combine sports knowledge and skills with extracurricular activities. Thus, students, lacking of achievement motivation, usually set the examination and credit as their goal and appear to be negative in study. From what has been discussed above, we may find that it is high time educators adopt incentive measures in campus education.

Learning to use is the most direct incentive motivation to inspire students to learn knowledge and skills. The combination of learning and practice should be emphasized in physical education and the platform for students to practice their skills should be built. The sports competition is a very good method to stimulate students' learning motivation. Students could show their sports knowledge and skills, fully arouse their inner potential and make clear the goal of their extracurricular sports activities. Only in the integration can learners establish motivation adaptability, face challenging task, so as to improve their ability.<sup>[3]</sup>

## **3 Analysis of Factors in Physical Education Management**

### **3.1 Favorable factors**

The parents and the school leaders pay less attention to students' sports activities, which has negative effect on physical education. To be admitted to university is the common goal of the students, the parents and the high schools. However, physical education is not a part of this examination, thus can hardly be valued.

In universities, though influenced by education utility, physical education is easier to be conducted because students have more spare time and less academic pressure. On the other hand, taking part in sports is man's nature and also one of the ways to relax and rest. For university students, it is also a good method to communicate with others. Thus, we may encourage students to take part in sports activity by emphasizing these advantages.

University students have more spare time compared with primary and middle school students. The relatively relaxed environment and loose school curriculum enable university students to have more time to dominate. Many students take part in sports activities voluntarily after class because sports activities have their own enchantment. Physical educators should carry out innovation in the management of extra-curricular activities to serve students better.

In China many sports facilities are not perfect in middle schools because of budget problems, and it is even worse in rural schools. But in universities, sports facilities are relatively perfect for various kinds of sports because of the support of the country. As long as we manage sports competition reasonably scientifically, we could make full use of college sports resources.

### **3.2 Unfavorable factors**

Because of the defects existing in present physical education in primary and middle school, numerous students hold negative views on physical education. In many students' mind, physical education means unimportance. No wonder they appear negative and careless in university sports course.

University students, who entered universities aged averagely 18 years old, have passed the best period for physical development. Without good physical education in primary and secondary school, they probably feel difficult to adapt themselves to university physical education. Therefore, it is necessary to promote indented sports competition based on hierarchical teaching.

### **3.3 Necessary factors**

Sports course is compulsory course for the freshmen and sophomores but optional course for juniors and seniors in universities. This is a vital period for students to form the awareness of lifelong sports.

College physical education is the last chance to cultivate students' life-long physical education awareness. The conception of integration teaching management model combined with the campus sports system reform and innovation



#### 4 The conception of Integration Teaching Management Model Combined with the Campus Sports System Reform and Innovation

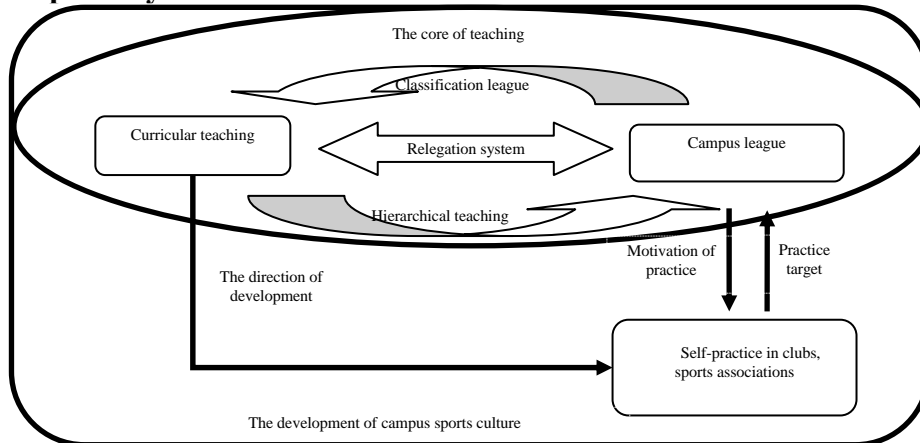


Figure 1 Model of Teaching

In this teaching model, club teaching, three autonomy teaching and stratified teaching are combined, and teaching management is innovated based on the teaching model.

Layered teaching is adopted in the core part of teaching and layered competition is adopted in campus competition, in which promotion and demotion run system in professional league is adopted to encourage students and the coach to take part in the training earnestly. What's more, layered competition can narrow the strength gap between the teams so as to avoid inferiority complex.

In campus sports culture construction, club teaching, sports association teaching, and independent teaching should be encouraged to replace class teaching. At the same time, self-independent exercise and campus competition should be complementary and can not be separated from each other. On the one hand, campus competition is the goal and driving force of extracurricular exercise. On the other, the improvement of students' sports level can promote the development of campus competition.

#### 4.1 In-class learning

Teaching: Skill teaching is the main part; students will be divided according to teaching project into three layers, high, medium and low level, without considering their age.

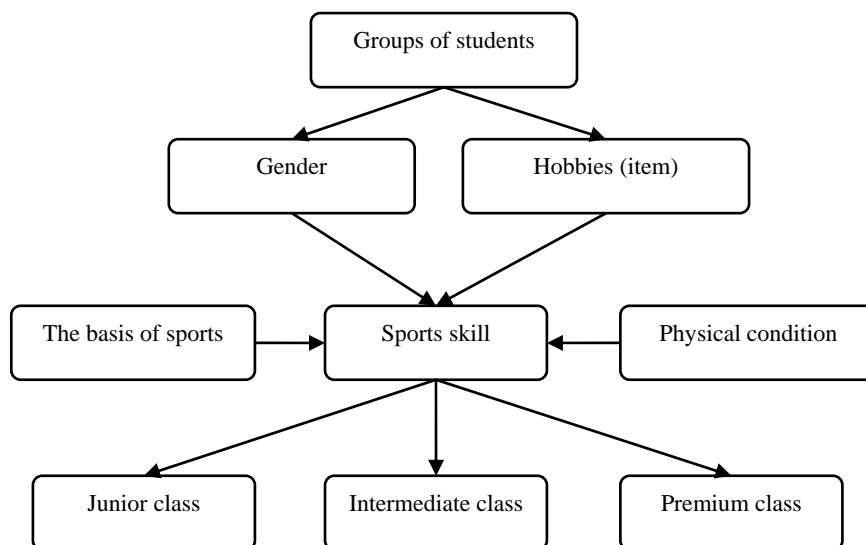
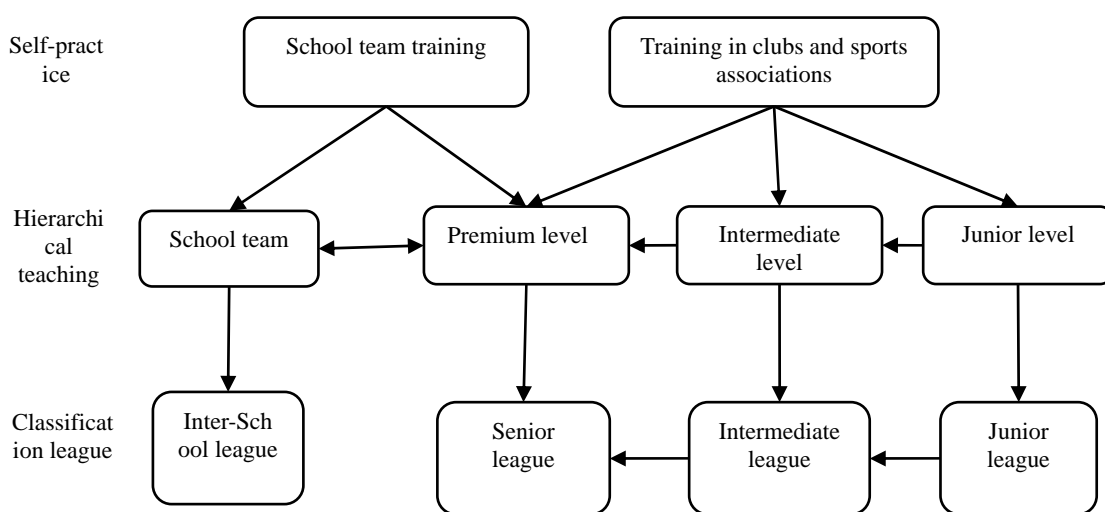


Figure 2 Classification of Students

According to stratified teaching and “three autonomy”, students should be divided into different groups according to their interests and sports skills instead of grade and class. Based on this classification, teachers can draw up specific teaching and training plan for students with different interests and skills. In this case, students can learn and make progress in a more appropriate environment. After the students choose the content of the class according to their interests and gender, the teacher could divide them into different layers according to their physical basis and personal conditions. Take basketball for example, height is one of the core factors. Students, who meet this requirement, can make progress even without physical basis.

**4.2 Extracurricular application**

Campus competition (the platform to show sports skills): There are three layers in teaching, and then campus competition should be divided into high, medium and low levels correspondingly. The purpose of campus competition is to implement a league system, in which clubs, sports associations and classes play as units. Stratified competition has extensive adaptability for students on different levels. In order to guarantee the fairness and competitive nature of the competition, promotion and demotion run system can be implemented.



**Figure 3 Figure of the Relationship Between Competition, Teaching and Exercise**

**4.3 Integration**

Promotion and demotion run system can be freely switched in classes of three levels, primary, medium and high, and this system can also be adopted in various campus competitions.

Self-independent exercise could adopt club training and “three autonomy” instead of class training. Sports clubs should be encouraged to complement campus competition and enrich the campus sports culture.

The ultimate goal is to set up a physical education system in which the sports clubs and campus competition interact complementarily and students form the awareness of long-life physical education.

**5 Conclusion**

The advantages of education utilitarianism should be learned and absorbed and students’ sense of happiness should be put in the first place in physical education reform. Learning to use should be the basic starting point of physical education, and the theory of achievement motivation should be one of the guiding theory in physical education reform.

University physical education has advantages in aspects of environment, policy, students’ spare time and sports facilities. However, students’ awareness of physical education and weak sports foundation need to be improved.

Integration teaching ideas absorb advantages of several teaching mode. Students, who could be divided into groups according to their gender, interests and sports skills, are encouraged to take part in sports clubs, associations and self-independent exercises after class. Stratified competitions could be carried out to stimulate students’ learning motivation, spread campus sports culture, and encourage students to show their skills.

Interest is the best teacher. Integration teaching management mode mainly serves to stimulate the students' participation in sports. This research explores the innovation of basic teaching and physical education mode, and we still need practice in actual management and operation.

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## An Empirical Study on Affecting Factors of Independent Innovation in Small and Medium Sci-tech Firms\*

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**Abstract:** Through a questionnaire survey of some small and medium Sci-tech firms, this paper analyses on the present situation of independent innovation, reveals the relationship between the firm's sci-tech resources input (R&D personnel quantity, R&D input intensity) and firm's performance. It also shows that affecting factors of independent innovation not only are the enterprise internal investment and R&D personnel, but also closely related to the factors from external innovation system. Such as, many firms eager to look for external finance supports, cooperative development and technical information service. The empirical analysis for sci-tech companies in Wuhan of China shows that the intangible assets of an enterprise (patent, copyright, trademark), and the R&D investment support from governments are positively related to firm's output. Finally, this paper puts forward some polices to enhance the firms' independent innovation competence.

**Key words:** Small and medium Sci-tech firms; Independent innovation; Affecting factors; An empirical study

### 1 Introduction

Small and medium firm is an important component of China's high-tech industry, and small and medium sci-tech firm is the most innovative part of small and medium firm groups. In the era of knowledge economy, improving the ability of independent innovation is an important source to obtain competitive advantage for small and medium sci-tech firms. In the international financial crisis period, as international and domestic economic environment has been more complex, knowing well affecting factors of independent innovation in small and medium sci-tech firms has important theoretical and practical significance on promoting the innovational ability and sustainable growth.

As the development of economic globalization, small and medium sci-tech firms face more serious competition environment, the shortage of investment and talent, poor information and technological such as congenital deficiency are prominent increasingly, especially insufficient investment on research and slow new product development lead to the insufficient of firms' independent innovation ability, which are common problems faced by small and medium sci-tech firms. This paper, based on the date of small and medium sci-tech firms in Wuhan, through the establishment of the model, empirically inspects the technological human resource input, the firm's R&D investment and the firm scale for influence on the independent innovation performance, and explains the relationship between variables corresponding to provide a theory and practice support for the relevant problems' research.

### 2 Research Model and Main Framework

#### 2.1 Concept model

In this context, put forward the relation model of affecting factors of independent innovation in small and medium sci-tech firms. Such as the following figure 1:

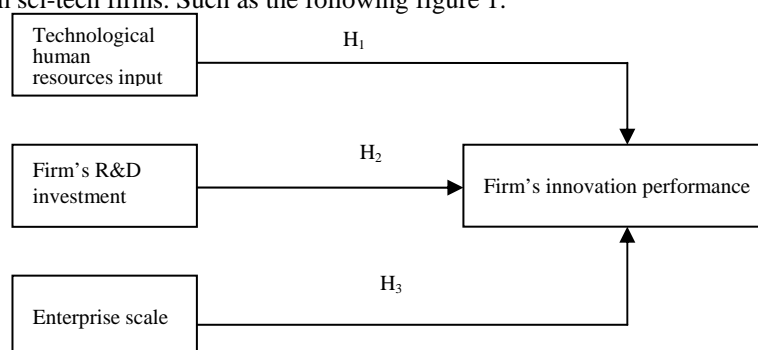


Figure 1 Relation Model of Affecting Factors of Independent Innovation in Small and Medium Sci-Tech Firms

\* Fund project: China Ministry of Education, Humanities and Social Sciences Research Fund (11YJA630226)

## 2.2 Variables analysis and research hypothesis

### (1) The technological human resource input and the firm's innovation performance

The technological human resource is often called scientific and technical personnel, belongs to human resources in a high quality, but it is different from the general human resources. In this paper, it mainly refers to R&D personnel, workers with college degree or above or with senior professional title, etc.

Patrick Ronde and C • Hussler's research (2005) based on the questionnaire survey of 14 industry and 22000 manufacturing firms in French, shows that firm's independent innovation ability has significantly positive correlation with its R&D personnel.<sup>[1]</sup> Domestic scholar, Qiren Zhou thinks that technical personnel is a kind of common resources and essential for the independent innovation of small and medium Sci-tech firms. Zhang Jie's(2007) empirical research shows that many important variables, effected on independent innovation and product upgrades of our country's firms, all refer to the related function of key technological personal.<sup>[2]</sup> Xutao Zheng(2009) chooses the data of 30 provinces in China to make an empirical analysis showing that the R&D input stock and human investment play important roles in promoting the independent innovation ability of firms in China<sup>[3]</sup> According to above review, this paper puts forward the hypothesis 1:

H<sub>1</sub>: The technological human resource input has a positive effect on the firm's innovation performance.

### (2) Firm's R&D investment and the firm's innovation performance

Firm's R&D investment is the necessary condition for its independent innovation. Small and Medium Firm Development and Research Institution of Central South University finds that, in technological innovation, the top 20 small and medium listed companies' average R&D investment is three times than the final 20 ones. Compared with foreign firms, the R&D investment of domestic firms is lower. The R&D investment proportion of foreign firms in most is more than 10%, but domestic firms' is only 1%, even some firms almost have no R&D investment, or own no R&D institutions.<sup>[4]</sup> The extent of the R&D investment not only acts directly on whether an firm can introduce and keep R&D personnel of high quality or not, but also determines whether an firm can buy advanced research equipment and own corresponding conditions for technical tests or not.<sup>[5]</sup> Guanghan Chen and Baojiang Lan (2007)<sup>[6]</sup> based on the provincial panel data in 1998-2004, find that the R&D investment in China has a significant effect on the ability of independent innovation. Yidong Hu and Weijun Zhong(2011)<sup>[7]</sup> think that R&D capital has much higher contributions on the technical innovations than R&D personnel. Firm's R&D behavior (new product development funds, technological R&D costs, technical reform funds) is closed to the ability of independent innovation.<sup>[8]</sup> The R&D investment in small and medium firms is an important mean to improve the ability of independent innovation. Therefore, this paper puts forward the hypothesis 2:

H<sub>2</sub>: The Firm's R&D investment has a positive correlation with the firm's innovation performance.

### (3) Firm scale and the firm's innovation performance

It has been always a hot point on the relationship between independent innovation and firm scale. Some studies reflect a positive correlation, but others reveal a negative correlation, mainly for the complexity of the independent innovation and the difference of variables selected.<sup>[9-11]</sup> For example, the index measuring the technological innovation performance is based on new product output or the patent output; and firm scale is measured by total employees or total assets, and so on, which all could affect on the performance evaluation and get inconsistent conclusions.<sup>[12]</sup> Yang Yong(2007)<sup>[13]</sup> proves firm scale is significantly positive related to firm's technological innovation performance through an empirical analysis. Yidong Hu and Weijun Zhong(2011)<sup>[14]</sup> think that total employees and total assets all have a significantly positive correlation with technological innovation output. According to above review, this paper, choosing total employees as the measuring index, puts forward the hypothesis 3:

H<sub>3</sub>: Firm scale has a positive correlation with the firm's innovation performance.

## 3 Research Process and Empirical Results

### 3.1 Survey situation of sample firms

In order to know well the present situation of independent innovation in small and medium sci-tech firms, in 2011, we took a questionnaire investigation, filled out by main technical management personnel and technological R&D personnel, on 78 small and medium sci-tech firms in Wuhan city. Finally got 41 effective samples and the recovery rate was 52.56%, which meet the demand of the samples for analyses. Firms researched are mostly key sci-tech firms in zone, the industry distribution as

follows table 1:

**Table 1 The Industry Distribution of Firms Researched in Wuhan**

Industry distribution	Electronic information	Biological medicine	Energy and environment	Equipment manufacturing	Others
Numbers	17	6	5	5	8
Rates	41.46%	14.63%	12.19%	12.19%	19.51%

**3.2 Regression analysis conclusion**

(1) Effect of technological human resource input

Statistical analysis shows that independent variables such as R&D personnel quantity, the proportion of workers with college degree or above, the proportion of workers with senior professional title and net assets have significant effects on the sale income in 2009.

Taking the sale income in 2009 as the dependent variable, the net asset as the control variable, R&D personnel quantity, the proportion of workers with college degree or above and the proportion of workers with senior professional title as independent variables, make an linear regression analysis. We first designed research regression model as equation 1.

According to the regression analysis form, we set the proportion of workers with senior professional title as  $x_1$ , the proportion of workers with college degree or above as  $x_2$ , net assets as  $x_3$ , R&D personnel quantity as  $x_4$ , the company sales income as  $y$ . According to the basic model designed, we get the test of statistical analysis.

$$y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \varepsilon \tag{Equation 1}$$

**Table 2 Regression Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.772a	.595	.535	17963.506	9.930	.000 <sup>a</sup>

<sup>a</sup>Predictors:(Constant) R&D personnel quantity, the proportion of workers with college degree or above, the proportion of workers with senior professional title and net assets(ten thousand yuan)

<sup>b</sup>Dependent variable: the sale income in 2009

According to statistical analysis showed in table 2, the statistic F in the table 2 is 9.93, the significant level is 0.000, so the linear regression equation is very significant. But the square of fitting coefficient of regression model is 0.595, showing that the model has the strong ability to explain.

In table3, the significant level of the proportion of workers with college degree or above is 0.021and the one of R&D personnel quantity is 0.003, showing that they are both significantly affect on the sale income. The VIF numbers are relatively small by the model linear inspecting, therefore, there are no multicollinearity in the model.

In the model, the net asset, as a control variable, is mainly used to control sales income of firms with different sales. R&D personnel quantity has a positive correlation with sales income, showing that firm's R&D personnel quantity growth will drive sales income increase. This is mainly because researchers bring more innovative technology for firms, strengthening continuously the innovation ability, and pushing the sales income growth. But in practice, firms must improve the ability of independent innovation to improve their sales income, which also are inseparable with R&D personnel. So it is one of measures to improve its ability that improve firm sales income by increasing R&D personnel quantity. The proportion of workers with college degree or above is negatively related to sales income, showing that the R&D level of firms is not sensitive to technical personnel's education required, so also failed to play a positive role.

**Table 3 Outcome of Regression Analysis<sup>b</sup>**

Model	Un-standardized Coefficients		Standardized Coefficients	t	Sig	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Constant <sup>a</sup>	21357.776	11927.585		1.791	.085		
$x_1$	555.187	616.242	.124	.901	.376	.789	1.268
$x_2$	-359.047	146.255	-.332	-2.455	.021	.819	1.222
$x_3$	.146	.181	.134	.809	.426	.544	1.840
$x_4$	159.078	48.462	.563	3.282	.003	.509	1.964

<sup>a</sup> Predictors:(Constant) R&D personnel quantity, the proportion of workers with college degree or above, the proportion of workers with senior professional title and net assets(ten thousand yuan)

<sup>b</sup> Dependent variable: the sale income in 2009

(2) Effects of firm's R&D investment

The R&D investment under 5 million yuan defined as low input, the R&D investment over 5 million yuan defined as high input, the sales income over 10 million yuan defined as high income and the sales income under 10 million yuan defined as low income, are listed as table 4:

**Table 4 The Crosstabulation of the R&D Investment and the Sales Income**

Count		The sales income		Total
		Low	High	
The R&D investment	High	5	30	35
	Low	4	2	6
Total		9	32	41

Seen from table 5, the significant test value of Pearson Chi-Square is 8.20(sig<0.01), so there are reasons to refuse the assumption that the R&D investment and the sales income are independent, that is the firm's R&D investment is related to the sales income.

**Table 5 Variance check List of the R&D Investment and the Sales Income**

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.203 <sup>b</sup>	1	.004		
Continuity Correction <sup>a</sup>	5.430	1	.020		
Likelihood Ratio	6.809	1	.009		
Fisher's Exact Test				.015	.015
N of Valid Cases	41				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .32.

(3) Effects of number of employees

The number of employees under 100 defined as less, the number of employees over 100 defined as more, the sales income over 10 million yuan defined as high income and the sales income under 10 million yuan defined as low income, are listed as table 6:

**Table 6 The Crosstabulation of the Number Of Employees and the Sales Income**

Count		The sales income		Total
		High	Low	
The number of employees	More	21	2	23
	Less	10	8	18
Total		31	10	41

**Table 7 Variance Check List of the Number of Employees and the Sales Income**

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.998 <sup>b</sup>	1	.008		
Continuity Correction <sup>a</sup>	5.193	1	.023		
Likelihood Ratio	7.233	1	.007		
Fisher's Exact Test				.012	.011
N of Valid Cases	41				

a. Computed only for a 2x2 table

b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is .39.

Seen from table 7, the significant test value of Pearson Chi-Square is 6.99(sig<0.01), so there are reasons to refuse the assumption that the number of employees and the sales income are independent ,that is the number of employees is related to the sales income.

**3.3 Hypothesis testing results**

According to above analysis, three hypotheses all have been proved, as follows table8:

**Table 8 Test of Hypothesis**

Hypothesis	Y	N
H <sub>1</sub>	√	
H <sub>2</sub>	√	
H <sub>3</sub>	√	

#### 4 Conclusion

This article, directly using data of some small and medium Sci-tech firms in Wuhan on the micro level, makes empirical analysis on affecting factors of independent innovation which contain the technological human resource input, the firm's R&D investment and the firm scale. According to existing empirical research, take respectively R&D personnel quantity, the proportion of workers with college degree or above, the proportion of workers with senior professional title, the firm's R&D investment and the number of employees as explanatory variations, and the sales income as explained variables. And descriptive results show that, the technological human resource input, the firm's R&D investment and the firm scale all have a positive correlation with firm's innovation performance. Based on the above analysis, this paper puts forward countermeasures as follows to enhance the firms' independent innovation ability.

Capital demand becomes the most important barrier for firms' independent innovation. No adequate funds, no abundant firm's R&D investment. Among firms investigated answering "what service project is needed to provide by government", 92.6 percent of the ones choose "capital support". Therefore, government should formulate the corresponding policy inspire firms to increase R&D investment and take various measures to increase the proportion of the technological of investment funds accounting for the finance funding. While, at the same time, government also needs to strengthen the supervision of the funds for investment in science and technological field, so that lead firms using the fund rationally and increasing efficiency of the use of the fund.

Firms in technological innovation activities should strengthen the talent strategy and the import of high-level technological innovation talents. When answered the question of "what innovation service type is needed", 51 percent of the firms choose "technical information service" and 48.8 percent of the ones choose "cooperative R&D". So both technical information service and cooperative R&D are the most requirements for small and medium Sci-tech firms.

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# An Approach Towards Medical Insurance Business Innovation Based on Japanese Customer Survey Data

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**Abstract:** The insurance industry in Japan has undergone drastic changes, since the new insurance business law became effective in 1996. Understanding customers' needs and values in purchasing insurance products has become more important for insurance institutions than ever before, because of not only environmental changes but also changes in customer behavior. From many areas of insurance that the life and non-life insurers cover, this study concentrates on the private medical insurance field in Japan, excluding national health insurance. The research goal is to elucidate customers' perceived value structure regarding medical insurance products and to obtain knowledge useful for performing business innovation of medical insurance. For the purpose, the data from both the attitude survey toward medical insurance products and the awareness survey on health was analyzed using the theory and method of Bayesian networks.

**Keywords:** Medical insurance business; Service innovation; Bayesian network modeling

## 1 Introduction

Consumers' attitude towards insurance products has greatly changed compared to before. Economic growth has recently slowed as a consequence of the current world economic crisis. And the labor force in Japan is shrinking because of the falling birthrate and the aging population. Accordingly, Japanese consumers came to put a higher value on the existence security that enhances the medical treatment, the pension, and nursing, rather than the expensive life insurance against death.

In addition, Japanese insurance industry has undergone the critical policy shift towards deregulation since the mid-1990s. Efforts to liberalize the industry have resulted in both the removal of many barriers to market entry and the promotion of cross-sectoral entry of life insurers and non-life insurers. It led to stiffer market competition. Under these circumstances, each insurance company must not only work harder at product differentiation but also create service innovation to survive.

Insurance companies will have to make changes to their traditional business models to attract and retain customers that are increasingly price-conscious while seeking better, more customized service. Understanding how happy current customers are with their insurance products and what factors affect their satisfaction/dissatisfaction helps insurers understand what service innovation they should tackle with.

From many areas of insurance that the life and non-life insurers cover, this study concentrates on the private medical insurance field in Japan, excluding national health insurance. It is because the private medical insurance market has historically been complicated but hot topic. The research goal is to elucidate customers' perceived value structure regarding medical insurance products and to obtain knowledge useful for performing business innovation of medical insurance. For the purpose, the actual customer survey data regarding medical insurance was analyzed using the theory and method of Bayesian networks.

This paper is organized as follows. Section 2 introduces the outline of Japanese insurance industry focusing on the medical coverage after 1990s. Section 3 explains the data and method, which were employed to elucidate the customers' perceived value structure regarding medical insurance products. Section 4 discusses the direction of measures for performing business innovation based on results of the analysis and empirical evidence concerning medical insurance. Section 5 provides the conclusions.

## 2 Japanese Insurance Industry Concerning Medical Care after 1990s

Japanese life and non-life insurance industry used to be heavily regulated. However, the situation changed after the mid-1990s. The insurance industry has undergone drastic changes since the new Insurance Business Law became effective in 1996, as aiming to loosen regulations on insurance companies. This law newly established Sector III Medical Insurance, the third field insurance services including medical insurance and nursing insurance [1]. By contrast, two other insurance fields had

already existed: Sector I Life Insurance including the whole life insurance and the ordinary term insurance, and Sector II Property and Casualty Insurance including the automobile insurance and the fire insurance. Before the law was implemented, foreign companies had monopolized the insurance services virtually classified into Sector III. However, the law allowed both life insurers and non-life insurers to enter Sector III, so that a variety of medical insurance products were launched in the market.

The number of contracts of the medical insurance belonging to Sector III has increased continuously since 2001. However, the way of adding a medical special contract to a Sector I Life Insurance product constitutes a still significant share of the medical service coverage in Japan. The market of the medical coverage is very competitive and complicated where it is still unclear how and why consumers choose insurance products.

Focusing on private medical insurance products containing both an insurance product of Sector III Medical Insurance and a medical special contract attaching to Sector I Life Insurance, this study explores the customers' perception and behavior about those commercial products and service.

### 3 Analysis of Survey Data Using Bayesian Network

We employed a probabilistic graphical model having the conditional dependency structure between random variables in order to explain customers' perception and behavior concerning medical insurance products. The theory and method was called a Bayesian network or belief network. A Bayesian network modeling is a machine learning technique for empirically identifying associations in complex and high dimensional data, so-called "structure discovery" [2-6]. In this study a Bayesian network modeling was applied to identify the structure of the customer-perceived value, using the data from both the attitude survey toward medical insurance products and the awareness survey on health.

#### 3.1 Consumer survey data

The following two datasets of Internet survey performed by a private research company in Japan were used to infer the model structure explaining the customers' perception and behavior.

- Survey on Health Awareness (survey period: May 1 to 5, 2010)
- Survey on Medical Insurance Enrollment (survey period: December 1 to 5, 2010)

Of the 2,002 respondents who participated in both the surveys listed above, we analyzed data from 1,631 respondents who clearly indicated their medical insurance enrollment status. These respondents included only those who selected "I have a stand-alone medical insurance (Sector III)," "I have medical-service coverage as part of a special life insurance contract (Sector I)," "I have both stand-alone medical insurance and medical-service coverage as part of a special life insurance contract," or "I do not have medical insurance." The respondents were from throughout Japan without any specific regional variation. The breakdown for gender was 49% for males and 51% for females; and for age, 39% were 39 years and below, 35% were 40 to 49 years, and 26% were 50 years and above.

We extracted from the survey questionnaires the attributes that fell into one of the following seven major categories as being likely to be related to customer values on medical insurance. Accordingly, 67 attributes were selected in total, and then we conducted a Bayesian network analysis using them; the description of each category and the attributes within them is as follows.

##### 1) Demographic characteristics of a respondent (5 attributes)

These are answers to questions relating to gender, age group, marital status, presence of children, and household income levels.

##### 2) Health-conscious behaviors of a respondent (21 attributes)

These are yes or no answers to questions on 21 behavioral attributes about maintaining and improving health, such as "play sports," "walk as much as possible," and "eat breakfast every day."

##### 3) Perceptions on health of a respondent (9 attributes)

These are yes or no answers to questions on a respondent's perception about nine health awareness attributes, such as "want to live longer," and "don't want to be sick."

##### 4) Benefits sought from medical insurance products (15 attributes)

These are yes or no answers to questions on 15 medical insurance attributes to determine whether that benefit would be a decisive factor when a respondent select a product, including "inexpensive monthly premiums," and "lifetime premium payment period."

##### 5) Source of health information (9 attributes)

These are yes or no answers to questions on nine information sources, such as the TV, radios, newspapers, and the Internet, to determine whether a respondent obtained health information from these sources.

#### 6) Medical insurance purchase channels (5 attributes)

These are yes or no answers to questions to determine whether a respondent used one of five channels to enroll in their insurance, including “acquaintance or referral,” “sales visits,” and “direct mail or flyer.”

#### 7) Medical insurance evaluation attributes (3 attributes)

Answers to the following three questions were used as evaluation attributes: “medical insurance enrollment status,” “satisfaction with your current medical insurance,” and “considerations about renewing medical insurance in the future”

### 3.2 Method of analysis

Considering all attributes as stochastic variables constituting the Bayesian networks, we inferred the structure of the Bayesian networks from data. First, we set the three attributes of medical insurance evaluation as dependent variables to be explained and developed in advance some hypotheses about rough relationships among the seven attribute groups. After incorporating constraints according to each hypothesis, we searched for a reasonable graph structure of Bayesian networks. While changing the assumptions and search conditions, we searched for the best graph structure to describe dependencies between attributes. The BayoNet software package was used to infer the Bayesian network structure, where Greedy Search Algorithm was used as the search algorithm and Akaike’s Information Criterion (AIC) and Minimum Description Length (MDL) were used as the information criteria. We then evaluated the resulting multiple graphs using AIC as the indicator and selected the model with the lowest AIC value as the best one. In addition, we verified the resulting graph to ensure that there was no bidirectional relation-ship or circular reference. Once a best Bayesian network structure was obtained, we conducted the probabilistic inference to evaluate each attribute’s effect, where an algorithm of Loopy Belief Propagation functioned.

### 3.3 Results and discussion

#### 3.3.1 Graph Structure

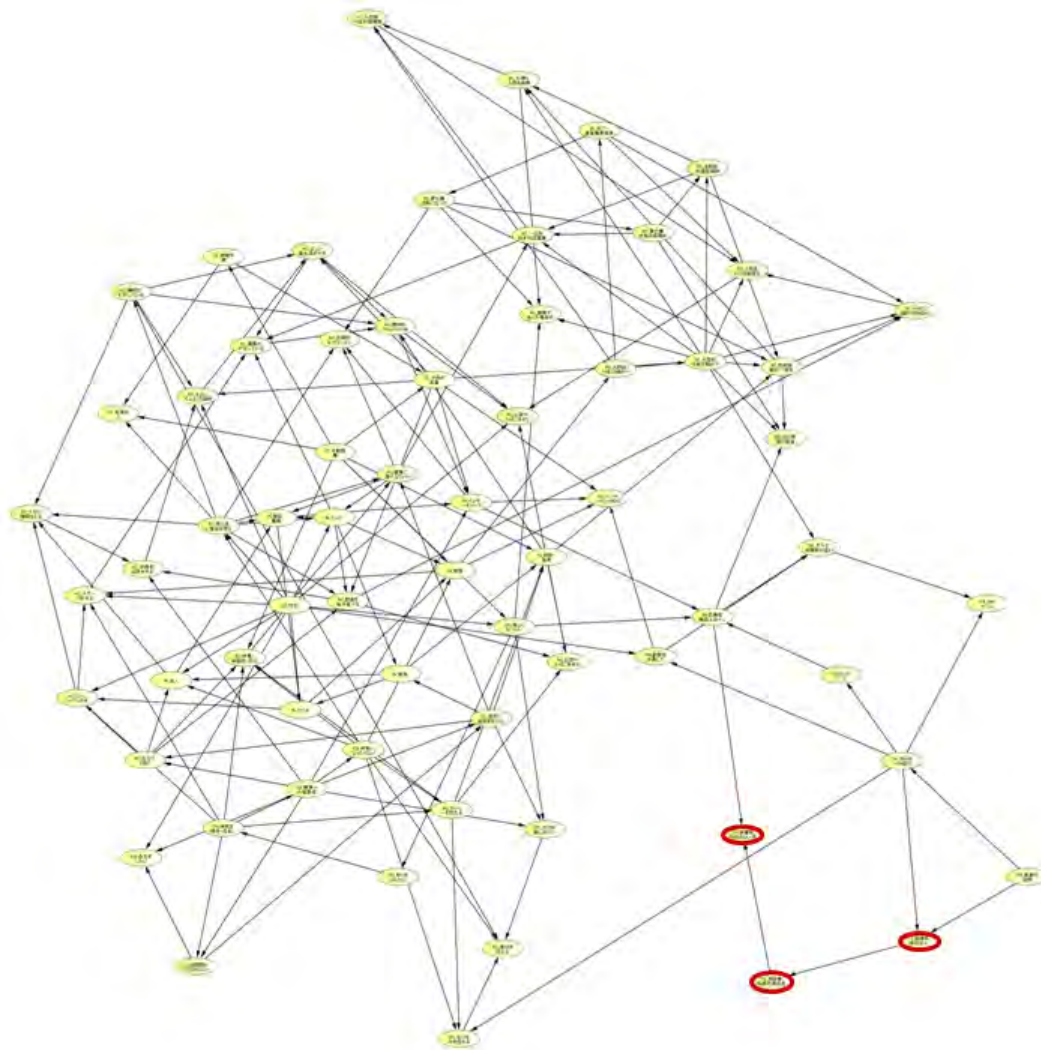
Figure 1 illustrates a best model obtained by the Bayesian network structure search. This model had the lowest AIC value of 107064.9.

Based on this graph structure, we identified the following findings relating to medical insurance evaluation attributes, which are shown in Figure 1 as oval objects in bold line.

- ✓ The attribute directly related to “satisfaction with medical insurance” is “medical insurance enrollment status.” None of the attributes in “benefits sought from medical insurance products” is directly related to “satisfaction with medical insurance.”
- ✓ The attributes directly related to “medical insurance enrollment status” were the two purchase channels, “sales person/agent’s visit” and “acquaintance or referral.”
- ✓ The attributes directly related to “considerations about renewing medical insurance in the future” were the evaluation attribute, “satisfaction with medical insurance” and the information source attribute, “preferred method of using the Internet when selecting medical insurance.”

#### 3.3.2 Findings from probabilistic inference

The results of the probabilistic inference to evaluate each attribute’s effect were as follows. The most effective way to increase the satisfaction indicator was to set the medical insurance enrollment status to “I have a stand-alone medical insurance (Sector III),” which increased the satisfaction indicator from 42.0% to 56.5%. When customers purchase medical coverage as part of a special life insurance contract (Sector I), their satisfaction indicator slightly improves (44%); however, this is a lower satisfaction level than when “stand-alone medical insurance” was used. The second most effective way was to set the purchase channel to “acquaintance or referral,” which raises the satisfaction indicator to 47.8%. “Benefits sought from medical insurance products” did not have a significant impact on the satisfaction indicator; it was only 42.8% even when the most influential benefit attribute of “low monthly premiums” was used. Similarly, the satisfaction indicator remained at almost the same level (42.1%) when the “lifetime premium payment period” attribute was used. Among the attributes within “preferred method of using the Internet when selecting medical insurance,” “use the Internet to gather information only” was found to increase the satisfaction indicator. However, at 43.5% the level was not significantly higher.



**Figure 1 Customer-Perceived Value Model Obtained by Bayesian Network Structure Search**

### 3.3.3 Discussion

From the results mentioned above, we found that the type of insurance policy that the consumer had enrolled in significantly influenced their satisfaction with their medical insurance. Being enrolled in a stand-alone medical insurance (Sector III) was associated with a higher level of satisfaction than having a medical special contract as a part of a life Insurance (Sector I). At the same time, we found that purchase channels also have a profound effect on the customer satisfaction.

And moreover, customers prefer to collect information using information and communication technologies (ICTs), such as the Internet. However, the face-to-face and word-of-mouth communication, such as referrals from acquaintances, has the largest effect on satisfaction levels.

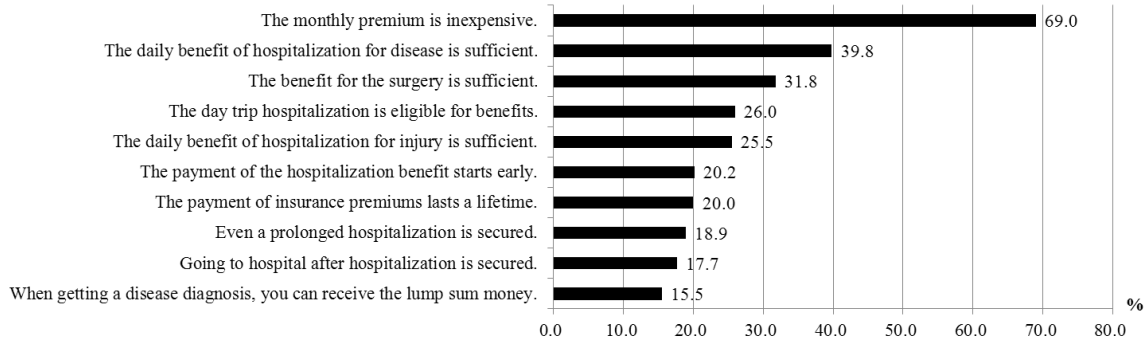
So when considering how to reflect these results in marketing strategies, we propose both product innovation and service innovation. Insurers should make an effort to understand the customer needs in varied situations and incorporate the solutions into the medical insurance product and service, which should belong to the stand-alone medical insurance (Sector III), because Sector III is much satisfying customers. It is vital for insurers to develop attractive content of insurance and also to curtail price increases of the monthly premiums. Insurers have to balance them through the innovation of the product and service.

On the other hand, insurers should notice that the face-to-face personal communication is currently considered more effective in this study than the communication provided over the Internet. However, today's customers are not interacting with insurers solely through an agent or a sales person. Consumers including potential customers are using not only Internet browsers and email software but also Twitter or

other social networking services. To succeed these days, it is not enough for personal-line insurers to excel at merely one of these channels. In short, insurers should connect with their customers across many channels, including face-to-face personal communication, websites in the Internet, Twitter, and Facebook. We call it a multiple channel policy, which is described in detail in the following section.

#### 4 Possible Measures for Insurance Business Innovation

The insurance industry now faces the rapidly proliferating array of consumer choices, just like other industries. So what sort of beneficial features do customers require from the medical insurance product and service? Figure 2 shows the top 10 list of customer requirements derived from the survey data used above. According to Figure 2, price is a major factor for insurance shoppers.

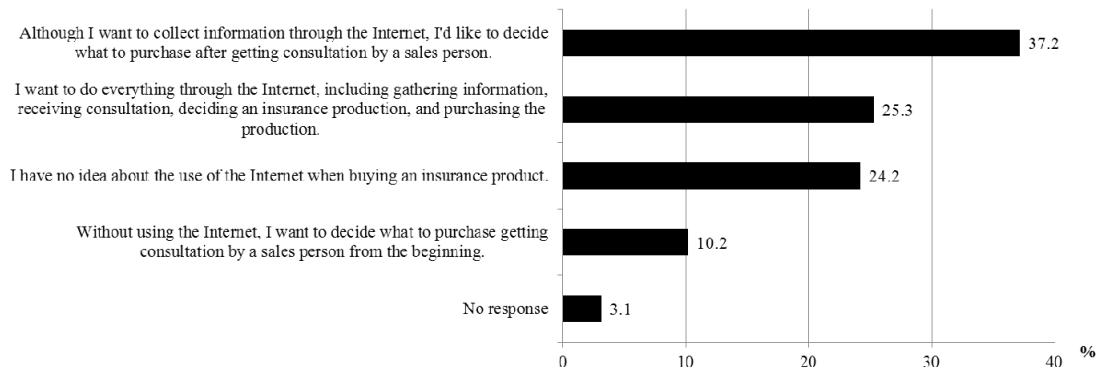


**Figure 2 Attributes Customers Require of the Medical Insurance Products and Service**

However, price is far from the only factor driving an acquisition decision. It is said that a today's typical consumer creates a simple list of potential insurers based on favorable perceptions of not only price, but also the following factors: trust in the brand, availability of coverage, and anticipated customer and claims service. Once a consumer determines that they have achieved an appropriate level of savings for the value he/she is receiving, he/she buys.

Just as automobile shopper may browse online before going into a dealership for a test drive, today's insurance customers appear to prefer to do their research online before making a contract with an agent or a sales person. Online channels provide a cost-effective way to educate and attract the potential consumer. In short, insurers having multiple channels will draw in customers most successfully by demonstrating that they have the capabilities to generate true value for their consumers (both price and service).

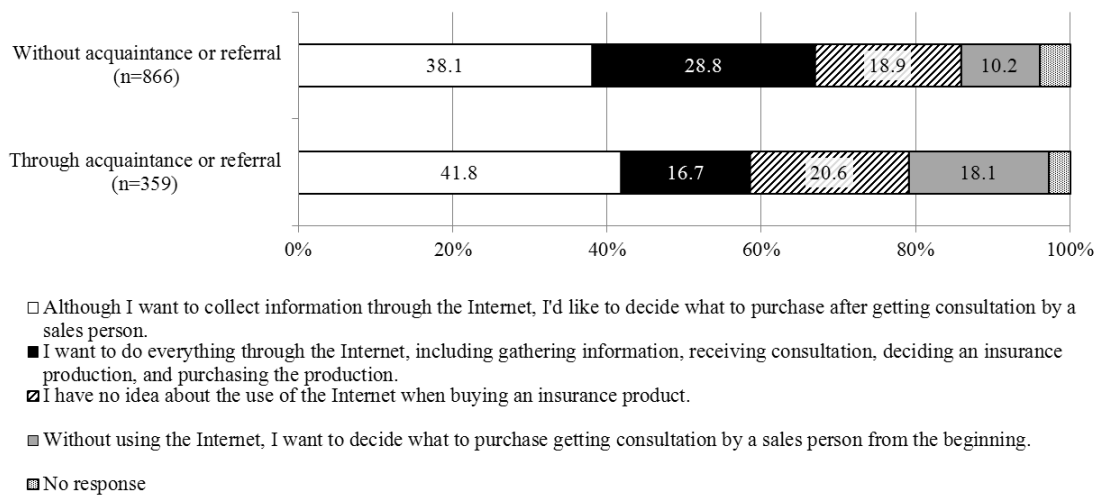
Online channels (such as social media and email) are cost-effective ways to maintain contact and build relationships when the right strategies are deployed. The face-to-face communication by an agent or a sales person is also critical to deepening the relationships with the important customers through customized coverage evaluations. An effective and integrated contact strategy makes the best use of all channels to deliver coordinated messages while driving more frequent interaction to build loyalty.



**Figure 3 Intention to Use the Internet, When Buying a Medical Insurance Product (in Total)**

Since there are several segments of target customers in the marketplace, insurers should select the combination of appropriate channels for each segment. Figure 3 shows customers' responses to the following question: how do you want to use the Internet when buying a medical insurance product? Figure 4 shows the breakdown of the same answer by a purchase channel that a respondent experienced when buying a current medical insurance product. The percentage of people who has the intention to make the most of the Internet when buying the medical insurance product is significantly different between the two groups, because of the difference of the purchase channel experienced. In the black part in Figure 3 this difference is especially remarkable. This indicates that the channel selection appropriate for a consumer segment is significantly important. Insurers can meet channel requirements by pinpointing their target customer segments and determining through which channels those customers want to interact.

An integrated, multi-channel model creates the opportunity to take advantage of the unique capabilities of each channel to drive interaction in a cost-effective manner. Of course, creating multiple channels in a company is challenging. However, the pursuit of the appropriate multiple channel system is a goal worth trying for, which leads to service innovation in an insurance company.



**Figure 4 Intention to Use the Internet, When Buying a Medical Insurance Product (Breakdown)**

### 5 Conclusion

In this study, we analyzed the structure of the customer-perceived value related to medical insurance products and demonstrated that a stand-alone medical insurance (Sector III) marked a higher level of satisfaction than a medical special contract as a part of a life Insurance (Sector I). We also indicated that the face-to-face personal communication is currently considered more effective in this study than the communication provided over the Internet. To succeed these days, however, insurers should connect with their customers using multiple channels, including face-to-face personal communication, websites in the Internet, Twitter, and Facebook. We illustrated that the channel selection appropriate for each consumer segment is significantly important to execute service innovation.

In the future, we will study the multiple channel effect by using a simulation so that we may better understand the dynamics of consumers' behavior when they select an insurance product. Specifically, we will carry out a multi-agent simulation by developing a model where various communication channels exist, such as word-of-mouth communication through face-to-face interaction, websites in the Internet, and social networking services when choosing a medical insurance product. The insights obtained will then be able to use to create more detailed strategy of the medical insurance business innovation.

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## A Study on the Enterprise Business Model Based on Industrial Value Chain

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**Abstract:** The business model innovation has become the important content in enterprise innovation in our country recently. This paper take the enterprise core value chain as a foundation, using the different change ways and its own foundation value activity innovation on the entire industrial chain, explained the process of enterprise business model innovation, then had pointed out five kinds of enterprise business model innovation type based on the ductility, partition, conformity, enhancement and mix and so on, namely value chain ductility, value chain partition, value chain enhancement, value chain conformity and value chain mixed type business model innovation.

**Key words:** Enterprise value chain, Industrial value chain, Business model

### 1 Introduction

Market competition become more and more intense, the enterprise wants to guarantee its own survival and the development, and obtain the competitive power which continues, they must innovate the business model. As Peter F. Drucker: "Now the competition between enterprise is not the product competition, but the competition of business model." Obviously, the business model is the enterprise competition highest shape, related to the enterprise life and death and the prosperity and decline, also success and failure. The enterprise's success must start from formulating the successful business model, the emerging new enterprise is this, the traditional old enterprise is so as well. After China's enterprise development has experienced the essential factor actuation and the investment actuation stage, now it has already entered the developed innovation actuation phase, the technological innovation is no doubt important, but it must take the business model innovation as the precondition, otherwise the market value of the technological innovation will be unable to realize<sup>[1]</sup>. But the enterprise business model's innovation practice depends on the study of the connotation, the innovation motive and the form mechanism of the enterprise business model. This paper carry on the analysis to the enterprise business model innovation's process and the type though the value chain theory, in order to impetus our country's native enterprise to carry on suitably, the effective enterprise business model innovation better.

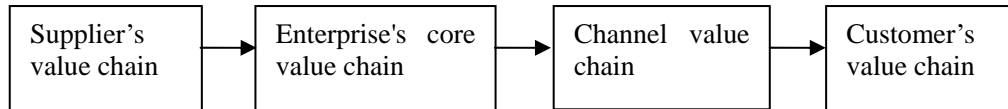
### 2 Enterprise Business Model Innovation Process Based on Value Chain

Many overseas scholars mentions enterprise's value chain more or less when definite the enterprise business model. Rappa(2004) believed that the business model had stipulated the position that the enterprise in the value chain, and instructed it to how to make money. And further pointed out that the business model was clear about what activity the enterprise to carry out to create the value, how to select the upstream and the downstream partners' position in the value chain, and the income institutional arrangements type achieved with the customer. The business model is an enterprise's pattern of enterprises and the partner network to carry on the value creation, the value marketing and the value provide, as well as produce the customer capital which is profitable, and can maintain the income<sup>[2]</sup>. These limits or the elaboration on the enterprise business model is a enlightenment function for us to explain that the enterprise business model innovation.

According to Porter's "value chain analytic method", enterprise's value activity may divide into the basic activity and auxiliary activity. And the five basic activity includes internal rear service, production work, exterior rear service, marketing and sales service, the four auxiliary activity including the enterprise infrastructure, human resources management, the technology development and purchases.

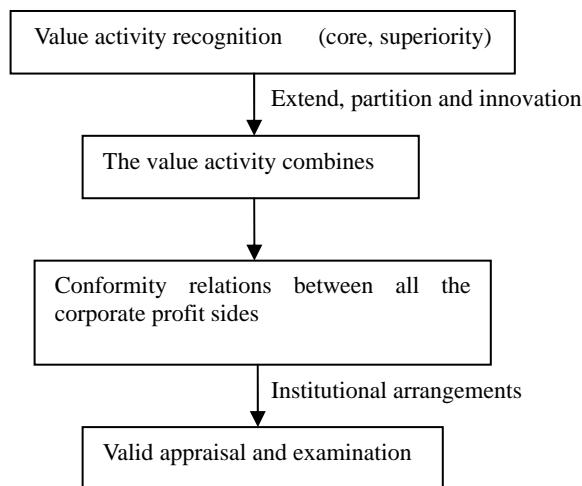
In the above nine kind of enterprise value activity contains many kinds of segmentation value activities and the value element, says generally, the porter's enterprise value chain included all the activity and the factor that has been able to create the value for the enterprise, also includes the enterprise organisational structure, the institutional arrangements, the value idea and the enterprise culture and so on. Porter also pointed out that the supplier value chain, the enterprise value chain, the channel value chain and the buyer value chain constituted the entire value system, the enterprise value chain connected with the

upstream supplier value chain and the downstream channel value chain at the same time, constitutes a complete industrial value chain(Figure 1). The value chain theory used is based on the enterprise core value chain (the classical value chain which porter defines), explained the enterprise how to realize the business model innovation by using different change ways on entire industrial value chain and own foundation value activity innovation.



**Figure 1 Industrial Value Chain**

Under the premise that did not consider the innovation to the value activity, The enterprise business model may constituted with the value activity on the entire strip value chain, or the industrial chain's fragment combination. under ability premise that in explicit exterior supposition condition, internal resources and ability, in some determination industry enterprise's business model is a function of the enterprise value chain, and may regard it as a enterprise gross value activity valid combination based on the value chain innovation, a total effective institutional arrangements realized by optimized conformity with the corporate profit side which involves these value activity. The enterprise may obtain the excess profit through the business model innovation. The enterprise may lengthen own foundation value catenuliform to become the enterprise business model, may also own foundation value chain partition, the function outsourcing reduce the value chain to form the enterprise business model, and also delaying and partition own foundation value chain at the same time to form the enterprise business model. May also carry on the innovation on one or many foundation value activity on the enterprise value chain to form the enterprise business model. What's more, the enterprise may choose one kind in the first three way to combine with the value activity to form the highly effective value module, finally links these value module to the effective value system. Because the industrial value chain has covered all value activity which the enterprise involved, this innovation based on the value chain can have a direct-viewing, clear, carry on the theory explanation comprehensively to the enterprise business model innovation. The enterprise may divided the value activity in the value chain into segmentation, distinguishes the superior and the inferiority in its own value activity, then optimize, reorganize, conformity and innovate among the exterior value activity, finally realizes the effective enterprise business model innovation(Figure 2).



**Figure 2 The Process of the Enterprise Business Model Innovation**

### 3 Enterprise Business Model Innovation Type Based on Value Chain

Known by the preamble analysis, the enterprise business model innovation is essentially a process that including the optimized choice, Improvement innovation to the inside and outside value activity, then arranges, the conformity to form the system again. According to the different formation mechanism

of the enterprise business model, may summarize for the following five kind of enterprise business model innovation.

### **3.1 Value chain delaying business model innovation**

This kind of business model innovation is in the enterprise value chain's foundation, through lengthens its both sides of the value activity, that is, extend to supplier value chain, the channel value chain and the customer value chain in the both sides of the profession value chain, or delays the similar value activity in certain value activity's lateral section to cause the enterprise value to cover the more value activities, for example the merger and acquisition of similar enterprise to realize the similar products' related multiplication, thus obtains the cost to be in the lead and the variation superiority<sup>[3]</sup>. Therefore, it may also divided into the delaying enterprise business model innovation to the longitudinal delaying enterprise business model innovation, crosswise delaying enterprise business model innovation and mix delaying enterprise business model innovation.

Delaying enterprise business model innovation makes the exterior value activity inside, this not only increased enterprise's value activity but also expanded the enterprise and each benefit side's relational network, including network value chain under enterprise's cooperation. The massive transaction cost can be saved through its effective institutional arrangements and the relational conformity (for example information search cost, negotiations cost and so on), to raise enterprise's whole response efficiency, then enhancement enterprise's whole competition strength and profit ability.

### **3.2 Value chain partition business model innovation**

The value chain partition enterprise pattern innovation is the partition, the peeling, the outsourcing on enterprise's foundational value activity, reduce the length of the enterprise value chain (reduce the length of the value activity), enterprise only retains these core value activity (these have the core competitiveness, and is imitated with difficulty value activity) and relative superiority value activity, based on this conformity the value activity's various benefits side particularly the partnerships, forms the effective institutional arrangements. This kind of enterprise business model innovation follows the basic principle that the total cost the enterprise engaged in the total cost which the foundation value activity produces to be higher than the new total cost which the value chain partition, the function outsourcing produces. The enterprise through the function outsourcing, may realize the resources, the essential factor and ability survival of the fittest with its partner enterprise, then reduce the total cost, enhance enterprise's agility and the flexibility, increase the enterprise excess profit. In value chain partition enterprise business model, the most representative is the OEM (Original Equipments Manufacture) pattern, that is the usually called sign production, the enterprise only retains the brand, the design, the finance and these essential value activity, but outsource the produce actives to the comparison superiority (is specially low cost) other enterprises.

### **3.3 Value chain enlargement business model innovation**

This kind of enterprise business model innovation is different from the former two types, it does not lengthen or reduce enterprise value chain, but only aims at the value activity innovation on the foundation value chain, thus forms core competencies that difficult to study or imitate. The value activity innovation is generally coordinates in several kind of value activities, both includes the technical stratification plane innovation, and the organisational structure, the institutional arrangements, the value idea and the enterprise culture stratification plane innovation, it's difficult for other enterprise to imitate. This enterprise business model formed by this kind of value activity innovation may have very strong cooperative effect, not only raises enterprise's operation efficiency, but also reduces enterprise's operation cost, enhance enterprise's core competitiveness<sup>[4]</sup>.

The product core value promotion and the core multiplication through the technological innovation are more common in the value chain enlargement business model innovation, then forms the unique enterprise business model.

### **3.4 Value chain delaying and the partition unify business model innovation**

Value chain delaying and the partition unify business model innovation is actually the synthesis of the first and the second kind of enterprise business model innovation. This kind of enterprise business model innovation is the partition and the outsourcing to the enterprise foundation value activity, also integrates enterprise's outside value activity into the enterprise value system, then optimized conformity the value activity and the benefit side relations, selects the effective organization method and the institutional arrangements. Therefore, it has the model merit both of the former two kinds. On the one hand, delays through the value chain, the enterprise may obtain the cost advantage, the coordination superiority and the scope superiority; on the other hand, it may enhance the enterprise agility and the flexibility, realizes the resources and ability survival of the fittest through the value chain partition, so it

may enhance enterprise's whole competitive advantage to a great extent. This kind of enterprise business model's success operation is very complex in reality, it requests the enterprise first to distinguish in own foundation value chain's superiority value activity and the inferiority value activity very prudently, then carries on the partition to it, meanwhile requests the enterprise to integrate own outside value activity into the enterprise value chain, and carries on the conformity to optimize to realize the whole cooperative effect.

### **3.5 Mixed enterprise business model innovation**

Mixed enterprise business model innovation is formed by introducing the innovative activities into the first, the second, and the fourth kind of enterprise business model. Therefore, it may also subdivide for the delaying innovation, partition innovation and delaying and partition mix innovation. The delaying innovation enterprise business model is formed by carrying on the innovation to its value activity ; the partition innovation enterprise business model is formed by the innovation on the superiority value activity after the partition; delaying and the partition mix innovation enterprise business model is on the foundation that delaying and the partition of the enterprise value chain, formed by optimized conformity the value activity after combining, including the value chain's delaying and the partition, the technological innovation, the institutional innovations, the organization way innovation and the cultural innovation and so on, it is the most complex, most competition vigor moreover to be also most difficult to be imitate in all the business model innovation.

The mix innovation enterprise business model is the most common kind of business model in the reality, because the enterprise must act according to own superiority to carry on the innovation unceasingly if they want to have the long-term maintains certain competitive advantage at the intense market competition. On the one hand, realize the survival of the fittest and the nimble response through value chain's delaying, the partition, obtains the cost to be in the lead with the management coordination; on the other hand, enhance enterprise core competitiveness, sharpens the enterprise variation business capacity through the value activity's innovation, create more values for the enterprise and the customer.

## **4 Conclusions**

The paper believed that the enterprise business model actually is an enterprise to carry on the value creation, the value marketing and the value provide the pattern of enterprises and the partner network forms, as well as produces the customer capital that is profitable, and can maintain the income, and the industrial value chain has covered the gross value activity which the enterprise can involved. Therefore, the enterprise business model innovation is essentially a process that the optimized choice, the improvement innovation and the reorganization conformity on the total value activity on the industrial chain. Based on the above understanding, the paper has analyzed the enterprise business model innovation process, predominant type and mechanism based on the industrial value chain. This research has certainly practical significance regarding to the instruction enterprise business model innovation.

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# Research and Analysis of Budget Methods of Marketing Expenditure Based on Flexibility

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**Abstract:** In recent years, the enterprise marketing expenditure budget has been the research hotspot in the fields of academy and industry all over the world. This article puts forward an idea that selecting budget methods of marketing expenditure should use flexible, dynamic idea, and it discusses the application of flexible budget method and rolling budget method in details, and builds a flexible operational mechanism to adjust the marketing expenditure effectively. Finally, it reaches the following conclusions: marketing expenditure budget based on flexibility is inevitable; available resources of enterprises, market conditions and opportunities should be considered in marketing expenditure budget; the combination of flexible budget method and rolling budget method is more effective, etc.

**Key words:** Flexibility; Marketing expenditure; Budget; Literature Research Method; Mathematical Model Method

## 1 Introduction

The enterprise marketing expenditure represents the expenditure which is used by enterprises for marketing management activities and practices in order to realize business objectives. With the trend of economic globalization, marketing expenditure in most enterprises is turning up sharply, which gobbles up a great deal of enterprise profits, and the proportion of marketing expenditure in the enterprise operational cost is increasing gradually. Therefore, more and more attention is being paid to the subject that includes how to form a flexible financial management that contains higher capabilities of external environment adaptability and internal resources integration, and how to utilize the marketing expenditure budget methods based on flexibility.

In foreign countries, the research of marketing expenditure budget mainly focuses on the analysis of marketing budget methods. Gary L. Lilien and John D. C. Little<sup>[1]</sup> analyzed a new method-the ADVISOR Project, which has higher adaptability. Nigel F. Piercy<sup>[2]</sup> proposed an organisational framework of enterprise marketing budget. B. Ramaseshan<sup>[3]</sup> pointed out that the common marketing budget methods resulted in the deviation between the theories and practices, so it's very necessary to propose a more complete, precise budget method. In China, the research mainly focuses on the analysis of marketing budget management. Song Lijun<sup>[4]</sup> proposed that there exist some problems in the budget management of marketing expenditure in China, such as the weak internal controlling of enterprise, imperfect organization of budget management, etc.

All the literatures above provide a sound basis for further study in this field. However, the researches on the quantity and quality of the specific budget methods of marketing expenditure are few. Therefore, this article will analyze the budget methods of marketing expenditure based on flexibility, in order to provide some theoretical supports and practical references for enterprises.

## 2 The Idea of Flexibility

### 2.1 Flexibility

Under the conditions of market economy, implementing a flexible marketing budget to adapt to changes in marketing environment have become inevitable trends. Originally, flexibility was a kind of "People-Oriented" management mode, while now it has changed to a management capacity-"response and adaptation to changes". So, the "flexibility" represents a kind of capacity that a system quickly and economically adapts to changes and uncertainty triggered by environment. In essence, flexibility refers to the capabilities of external environment adaptability and internal resources integration.

### 2.2 Financial flexibility

The financial flexibility means a sustainable, effective ability, enterprises have, to integrate the internal and external resources, and to cope with the environment of uncertainty and ambiguity in financial management system. It requests the enterprise to be able to adapt to changes, use changes, and create changes, which could develop enterprises' dynamic competitiveness, and achieve the financial goal. Specifically, it includes four kinds of abilities: buffer capacity, adaptability, coordination, and

innovation ability.

### 3 Marketing Expenditure Budget

#### 3.1 The definition and content of marketing expenditure budget

Marketing expenditure budget means making a budget for all expenditures used in enterprise marketing practices and activities. According to the marketing expenditure behavior, we can divide it into three types: fixed marketing expenditure budget, semi fixed marketing expenditure budget and variable marketing expenditure budget. Fixed marketing expenditures include the salesmen’s salary, rent of office space, etc. Semi fixed marketing expenditures include after-sales service expenses, advertisements and PR activity expenses. Variable marketing expenditures include expenses aiming at promoting selling the product, salesmen’s commission award. The types of marketing expenditures are given in Table 1, which takes the example of E-Lay Company in 2012. (Unit: ten thousands)

**Table 1 The marketing expenditure budget of E-Lay Company in 2012**

No.	Types		Contents	Unit expenditure	Total unit expenditure	Budget portfolio
1	Fixed expenditure		Salesmen’s salary	0.0296	0.0679	2000
			Rent of office space	0.0300		
			Office expenses	0.0001		
			Other	0.0082		
2	Semi fixed expenditure	Fixed part	Advertisements	0.0450	0.0453	2000
			PR activity expenses	0.0003		
	Alterable part	Logistics expenses	0.0400	0.0630	2000	
		Other	0.0230			
3	Variable expenditure		Promotion expenses	0.0050	0.0706	2000
			Salesmen’s commission	0.0337		
			Other	0.0319		

#### 3.2 The factors should be considered in selecting the methods of marketing expenditure budget

When selecting the methods of marketing expenditure budget, enterprises should consider all kinds of factors, such as available resources of enterprises, market competition conditions, market opportunity conditions, and other uncertain factors. Table.2 shows the factors and their contents or examples.

**Table 2 The factors should be considered in selecting the methods of marketing expenditure budget**

No.	Factors	Contents /Examples
1	Available resources of enterprises	Size of enterprise, reserves for marketing expenditure, enterprise culture, PLC (product life cycle), financial technology, etc.
2	Market competition conditions	Quantity of competitors, marketing strategies of competitors(especially the leading enterprise) ,etc.
3	Market opportunity conditions	Demands which have not been met , such as market opportunities of products, industry, regions ,etc.
4	Other uncertain factors	Consumption psychology of consumers, all kinds of possible crises(such as the problem of product safety, the contradiction between the consumers and salesmen), etc.

### 4 Analyses of Budget Methods of Marketing Expenditure Based on Flexibility

#### 4.1 The model of flexible budget method

##### 4.1.1 The definition of flexible budget method

The flexible budget represents the expenditure formulating mode based on the analysis of expenditure behavior, which is used to reflect the expenditure level and the income level under different professional competence according to the relevant budget amount calculated out by various portfolio levels predicted by plans or budgets. The flexible budget is adjusted in accordance with the portfolio changes, and many kinds of portfolio changes in the plan period are considered in this method. Thereby, it is also called the alteration budget. The basic premise of flexible budget is to classify all the cost into variable expenses, constant expenses and semi variable expenses according to the expenditure characteristic and state (the dependence relationship between the total expenditure changes and the portfolio level).

##### 4.1.2 The model of flexible budget method

Suppose the relation between budgeting enterprise marketing expenditure and the portfolio is the typical linear relation, then the way to budget the marketing expenditure would be like the following.

$$Y = (a + b_1) + (b_2 + c) X \quad (1)$$

In the formula,  $Y$  represents the total marketing expenditure of the budget. The  $a$  represents the constant expenses of the budget,  $b_1$  represents the fixed part of the semi constant marketing expenses of the budget,  $b_2$  represents the amount that the alterable part of the semi constant expenses allocated to the unit's business in the budget. The  $c$  represents the variable expenses of the unit budget, and  $X$  represents the budget portfolio. Table 1 gives an example of marketing expenditures of E-Lay Company in 2012. According to the formula (1), we can get that:

$$\text{Known } a = 0.0679 * 2000 = 135.8,$$

$$b_1 = 0.0453 * 2000 = 90.6,$$

$$b_2 = 0.0630, c = 0.0706, X = 2000,$$

$$\text{Thus } Y = (a + b_1) + (b_2 + c) X = (135.8 + 90.6) + (0.0630 + 0.0706) * 2000 = 493.6.$$

Some discussions about  $a$ ,  $b_1$ ,  $b_2$ ,  $c$  in the formula will be carried out as the following.

As for  $c$ , the variable expenses, the total amount will be changed in proportion with the portfolio. The unit expenditure is not influenced by the output changes, and its amount keeps in a specified level all the time. The budget of the variable expenses is calculated by the ascertained budget value of unit change timing the portfolio anticipated.

From the static aspects, the budget method of  $c$ , the variable expenses of the unit budget in marketing expenditure, can be done by the flow in the chart 1 with synthetic consideration of the following factors, such as market competition conditions, market opportunity conditions, profit conditions of enterprise unit's business and enterprise implementation ability, etc. It would be wrong to only consider some single factor or the enterprise leader's personal favor to decide the budget of unit's variable expenses.

From the dynamic angle, the budget of  $c$ , the variable expenses, is mainly about to add one emergency response mechanism in the process of the marketing expenditure budget. And then according to the specific industrial circumstances of the enterprise, the adjustment of the marketing expenditure budget can be carried out every three months or every half a year on the basis of the practical conditions of the portfolio to decrease the marketing expenditure waste caused by the absence of the adjustment mechanism.

As for the fixed marketing expenses, since its total amount is not influenced by the portfolio changing in the related areas, there are difficulties to budget it by carrying out the flexible budget method directly. The idea of budget this part of expenditure is to consider the integration of the resource conditions of enterprises, the market competition conditions, the enterprise tactics and the market opportunity conditions synthetically, and then decide the total investment amount of the fixed marketing expenses of enterprises.

The model is as the following:

$$I_g = f(x_1, x_2, \dots, x_n) \quad (2)$$

In the formula (2),  $I_g$  represents the investment amount of the fixed marketing expenses. The  $f$  represents the investment function of the fixed marketing expenses. And  $x_1, x_2, \dots, x_n$  represent the decisive factors of the investment amount of the fixed marketing expenses.

As for  $b$ , the semi variable expenses, though its total amount is influenced by the changing of the portfolio level, the alteration range keeps no strict proportion with different portfolio changes. In fact, it is the mixed expenditure mingled with  $b_1$ , the restraining constant expenses, and  $b_2$ , the considering constant expenses. The constant expenses mainly belong to the marketing ability expenditure, which is related with the formation of the whole enterprise marketing ability and its regular upkeep. Once the enterprise marketing ability formed, it is very difficult to make a significant change in a short period. It will exist a long period to anticipate the related expenditure. Thereby, the restraining constant expenses are unavoidable and need to be fully satisfied preferentially. They have certain controllability. But the considering constant expenses are comparatively more flexible and the amount can be ascertained by the income situation of the unit and the operational need. They have a kind of uncontrollability. Thus to ascertain the budget amount of the considering constant expenses reasonably is the most important factor to make full advantages of the budget for controlling the constant expenses.

Hence, as for the budget of the semi variable expenses  $b$ , at first,  $b$  should be disassembled into  $b_1$ , the restraining constant expenses and  $b_2$ , the considering constant expenses. Then budget  $b_1$  by the budget method of fixed marketing expenses, and budget  $b_2$  by the budget method of variable marketing

expenses.

**4.2 The model of rolling budget method**

**4.2.1 The definition of rolling budget method**

Rolling budget method is also called sustained budget. It means according to the principle of paying particular attention to the recent situation in details and a rough attention to the future briefly, on the basis of the budget completion situation of last term, to adjust and concretely formulate the budget of the next term, and roll the period of budget formulating forward regularly and sustainably to keep a certain time range among the budget.

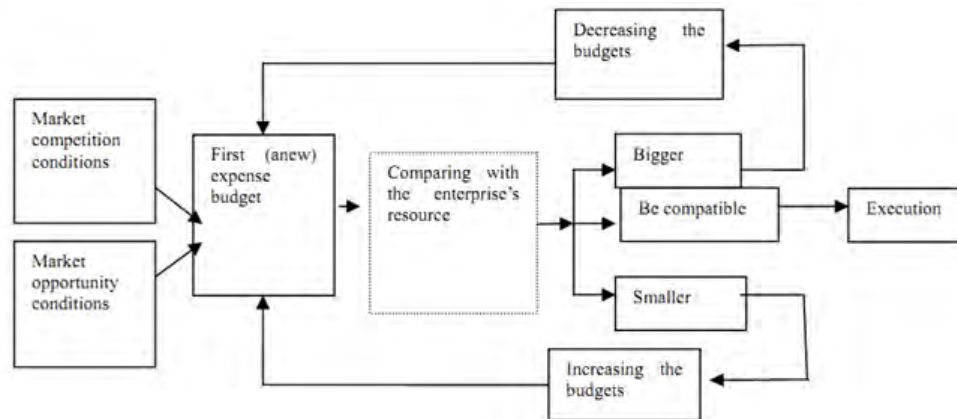
**4.2.2 The model of rolling budget method**

The model of rolling budget method in the marketing expenditure budget may be consulted from the above-mentioned application methods of the flexible budget method in the marketing expenditure. The marketing expenditure can be divided into the fixed marketing expenses, the variable marketing expense and the semi variable marketing expenses, etc. The budget period may be extended longer when the rolling budget method is used for the fixed marketing expenses, such as a year or half a year. But the budget period needs to be shorter when it is used for the variable marketing expenses. The cost of the semi constant expenses budget can be classified into restraining fixed budget and considering fixed expenditure, and then the rolling budgets can be calculated by the periods of the constant expenses and the variable expenses respectively.

To budget the enterprise marketing expenditure with the rolling budget method can have the budget and the actual conditions fit more in each other and produce the best possible results of conducting and controlling. It is also helpful for various levels of the management crew in the enterprise marketing system to keep careful and detailed consideration and the comprehensive plan of the future marketing work to guarantee it carried out methodically.

**4.3 Integration mechanism of flexibility and marketing expenditure budget adjustment**

Making a marketing expenditure budget needs an all-sided consideration that includes company's recourses and market competition. The basic flow chart, which is based on competition, market opportunities and resources, is illustrated in the Figure.1. The establishment of the integration mechanism between flexibility and budget adjustment of marketing expenditure should be set as the following.



**Figure 1 The Basic Flow Chart of Marketing Expenditure Budget Based on Competition, Marketing Opportunities and Resources**

**4.3.1 A certain amount of marketing expenditure reserves should be kept by decision-makers**

In the process of marketing decision-making, decision-makers should hold a certain amount of reserves for marketing expenditure adjustment in case of emergency. It needs to consider the available resources, market opportunities and other uncertain factors comprehensively, and be based on the principle of “effectively use, moderately loose”.

**4.3.2 Constructing specified organization of market analysis which concentrates on analyzing market opportunities, competitors' dynamic situation and market emergencies**

For the convenience of decision-makers to adjust the marketing expenditure budget, the green channel through which analysts can suggest decision-makers directly should be established once market opportunities and competitors' dynamic situation influencing the industry competition are discovered,



and a huge expenditure increase or decrease needed by market emergencies occurs.

#### 4.3.3 Constructing supervision and evaluation mechanism of marketing expenditure usage

Constructing a supervision and evaluation mechanism requires enterprises to make the following efforts: 1)formulating evaluation indices of marketing budget, include salesmen's performance, product market share, consumer satisfaction, added value of marketing profit, etc; 2) constructing salesmen's reward-punishment mechanism in order to control the marketing expenditure budget effectively.<sup>[5]</sup>

## 5 Conclusions

Through the research and analysis in this article, we can draw the following conclusions: 1) with the trend of economic globalization, adjusting the strategies and methods of enterprise financial management timely has stronger realistic significance; 2)decision-makers should consider the available resources, market strategies and opportunities of enterprises comprehensively when making the marketing expenditure budget; 3) selecting budget methods of marketing expenditure should use flexible, dynamic idea which combines resource guide, competition guide and market guide together; 4) the combination of flexible budget method and rolling budget method is more effective.

At the same time, we also should notice that, the research and analysis of budget methods of marketing expenditure based on flexibility in this article is not comprehensive enough, and the effectiveness of these budget methods in enterprises also needs to be carried out in practice test. I hope the analysis and research will provide theoretical supports and practical significances for further study of marketing expenditure budget.

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# A Study Discussing Cultural Soft Power of the State and Its Enterprises Is the Fundamental Way to Be a Powerful Trading Country

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**Abstract:** In recent years, China's foreign trade surplus, especially U.S. trade surplus, has aroused broad international interest, even leading some countries to react as so-called "counter". At present, the production of a number of products in China are at the forefront of the world, the international balance of payments surplus is very large, but this does not mean that we are a powerful trading country, and does not urge the continued development of the national economy. In my opinion, in order to make the country strong and sustained development, we must foster the concept of powerful trading country, use soft power of the state and its enterprises as the correct and effective measure to be a powerful trading country. Speaking from the phenomenon level, trading is a kind of exchange among different regions, but from the essence level it is a process that makes an optimal allocation of resources among regions or countries. Therefore, the commodity exchange through the trading activities, in essence, is to maximize the regional or national interest through circulation of commodities. A country with large trading quantity is not always a country with strong trade power. A large trading country maybe is just the large volume of trade, rather than the maximization of the various national interests. For China's sustained economic and social development, it is not enough to be a large trading country, we have to build a powerful trading country. Building a powerful trading country, especially in the 21st century, could not depend on natural resources and cheap labor, but the cultural soft power of a state and enterprises. From the perspective of international trade, that is not to depend on the entity trade, but to depend on the trade in services. Therefore, it is the fundamental way solution of developing trade in services, constructing the powerful trading country, achieving sustainable development of China to enhance the soft power of our country and enterprises, to rely on the construction of China's traditional culture, which greatly improved the cultural quality and the level of knowledge of our people.

**Key words:** Trade; Powerful trading country; Soft power

## 1 Introduction

There has been over 30 years since China's starting reforming and opening up, and in the process of transition from planned economy to socialist market economic system with Chinese characteristics, the strength of market opening and international dependence is still increasing. In the last 30 years, we have took full advantage of the comparative advantages of large cheap labor supplies and relatively sufficient natural resources is to actively participate in international economic cooperation and competition, achieve China's rapid economic growth, and the scale of international trade has been top ranked in the world. The year before last, China's GDP has surpassed Japan, has become the world's second largest economic entity; total exports exceeded that of Germany, the domestic trade is also very active; the long-term huge surplus of the international balance of payment has made China become a big country with veritable industry power and trade power. (See Table 1).

**Table 1 A Comparison Table among China, the United States, Japan and the EU in GDP , Steel Production, Coal Production, Oil Production and Automobile Manufacturing Volume in 2009**

Project Country	China	United States	EU	Japan
GDP (Unit: 100 million dollars)	87670	142600	145200	41410
Steel Production (Unit: 10,000 tons)	56780	5810	13910	8750
Coal Production (Unit: million tons)	1552.9	539.9	420.4	0.7
Oil Production (Unit: one hundred million tons)	1.89	3.253	8.548	-
Automobile Manufacturing Volume (Ten thousand)	1379	571	1524	793

Note: GDP data is from the the Huitong network; steel production data is from the statistics of the Brussels World Steel Association, January 22, 2010; coal production and oil production data is from" BP World Energy Statistics

2010"; the data of automobile manufacturing volume is from Association of China Automobile industry "in 2009 the world car production data".

However, the growth of GDP has brought the consumption of large quantities of resources and serious pollution of the environment and other issues. At the same time, the level of domestic consumption and the general national wage haven't been improved in a long term, and the rapid growth of national economy is fulfilled by an extensive management which relies on inputting all types of materials. (See Table 2)

**Table 2 2008 the World's Major Countries (Regions) of Trade in Services and Trade in Goods Accounted Situation**

Unit: one billion U.S. dollars

country/ region	Total foreign trade	Trade in Services		Trade in Goods	
		Sum	Proportion(%)	Sum	Proportion(%)
United States	4353	886	20.4	3467	79.6
Germany	3191	520	16.3	2671	83.7
Japan	1854	310	16.7	1544	83.3
England	1572	482	30.7	1090	69.3
France	1606	290	18.1	1316	81.9
Italy	1351	255	18.9	1096	81.1
China	2866	304	10.6	2562	89.7
Netherlands	1402	194	13.8	1208	86.2
India	559	197	35.2	362	64.8
EU	15435	3254	21.1	12181	78.9
<b>World</b>	<b>39742</b>	<b>7200</b>	<b>18.1</b>	<b>32542</b>	<b>81.9</b>

Therefore, in order to achieve the sustained and healthy development of national economy, to enhance our international competitiveness greatly, it is necessary for our country to range from a large trading country to a powerful trading country. There are some reasons. firstly, the high-end status of global value chain represents the great circulation ability, brand ability and value conversion ability, which belong to the horizontal division of labor in international processing, but China's current trade situation reflects the vertical division of labor, and in the lower end of the value chain; secondly, high production and labor efficiency is to use less inputs to output a relatively high value, while China's current trade situation reinforces the consuming of resource costs, the destruction of environment and ecology environmental and labor welfare and other issues, which do not meet the requirements of high efficiency; thirdly, at present, we take tangible products which are based on all kinds of resources to exchange with other countries intangible products which are based on knowledge service. The United States and other developed countries use knowledge and other intangible products to get our scarce resources. As for making international trading as a means to get international interests from the process of allocation of global resources, China is still very backward. Therefore, considering from a perspective of global strategic thinking, we must recognize the importance of changing from a large trading country to a powerful trading country, and need to see domestic trade and foreign trade as a whole.

April 18, 2010, the Ministry of Commerce in the Canton Fair held the transformation of foreign trade development mode report, and put forward at the meeting to initially achieve the goal of powerful trading country in 2030. There are two steps to achieve the goal. The first step is to consolidate the status as a large trading country before 2020, promote the process of powerful trading country; the second step, in 2030, initially to achieve the goal of powerful trading country. October 31, 2010, the National Institute of Business Economics, Beijing Technology and Business University with many universities professors and experts of circulation of commodities, held the first "powerful trading country" forum in Beijing, fully discussed a series of problems related to powerful trading country and published the "Beijing Declaration". However, although the social parties start to focus on the issue of "powerful trading country", there are still many basic theoretical questions have not been sorted out yet.

Furthermore, we must have a deep understanding of how to implement a powerful trading country.

## **2 The Essence of Trading is to Optimize Social Resources Among Countries**

The process of social reproduction is divided to four parts: distribution, exchange and consumption. Trading belongs to exchange part of which the essence is to achieve the balance and rebalance of social resources (Marxist "political economy critique"). In human society, due to the existence of Social specialization division and labor collaboration, people need to exchange products of labor in their producing and life. However, this is not the general sense of "exchange", under the condition of commodity economy, this exchange is essentially the mutual exchange of people's living labor or labor, and in social economic activities it is shown as Commodity Exchange. Marx said: " the developed form of exchange is trade ", trade is also the developed form of commodity circulation.

### **2.1 Exchange of commodities developing with the development of commodity economy**

Based on two basic premises of social division and labor products to different owners, and with the development of social productive forces, trade, as a specific commodity exchange activities, has experienced three stages, a direct barter between the producers, a concurrently trade between producers directly use the money as a medium and businessmen specialized trade. In the three stages, the contents of trade activities enrich constantly. The goods of exchange include both tangible goods such as production and consumption materials, and other intangible goods such as labor services; trading space is more and more wide, including regional trade activities, national trade activities, and the international trade among countries.

### **2.2 Exchange of commodities is an effective means of the balance and rebalance of various social resources among countries**

The form of commodity exchange and commodity circulation has transformed from direct bartering among producers to exchanging of tangible or intangible goods by merchant intermediation in vast areas of space.; the reason has transformed from the initial production constraints, which makes them not self-sufficient in some respects, to obtain the comparative advantage of using their own resources to conduct the selective production of the goods. On this point, the Western classical economists Adam Smith and Ricardo have a very brilliant complete exposition. Therefore, the substances of commodity circulation activities, the parties who participate in exchange activities meet their own multifaceted needs by exchanging their own goods. During the exchange process, the value of various social and natural resources is achieved behind the commodity exchange. In this sense, we believe that the essence of trade is to adjust the balance and rebalance of various types of social resources among countries.

### **2.3 International trade is the balance and rebalance of worldwide resources under the conditions of economic globalization**

Under the conditions of developed commodity, economic globalization has been deep into the various aspects of social-economic, the geographical scope of the trading activities is increasingly wide, the scope of the rebalance of social resources develop from national internal area to among countries. The domestic trade is the rebalance of the country's internal resources, which promotes the development of economy and culture around the country. At the first, because of the differences of the geographical environments, cultural practices, such as resource endowments, every area can take advantages of local resources, avoid weaknesses to establish a specialty manufacturing industry for fully improving the utilization rate of resources, which is conducive to the improvement of economic efficiency and the blend of inter-regional cultural. Secondly, the State may regulate the distribution of national income and consumer attitudes by the terms of trade and cultural values to guide the consumer demand, balance interests among the regions, industry to achieve coordinated development of the country.

International trade is the balance and rebalance of various types of resources in the worldwide under conditions of economic globalization. Firstly, the development of international trade makes each country complementary division of labor according to the production technology, the ratio of the factors of production, the difference of the production scale of to gain a win-win. Secondly, international trade strengthens the multifaceted contacts among countries. By the commodity circulation among countries, they obtain the respective differences in interests based on their own advantages, which greatly improve the strength of the country in all aspects.

## **3 The Powerful Trading Country is the Strategic Choice to Achieve National Strength and Prosperity**

According to the principle of Marx economics, the commodity circulation itself does not create any

value. However, the commodity circulation is an important way to achieve the value of the product, adjust market supply and demand. Merchandise trade makes the production and reproduction of the national economy, and promotes the development of national social-economic and the improvement of people's living standards. Therefore, the trade, especially the international trade among countries is a strategic choice to achieve national strength and prosperity which enhances the comprehensive strength of a nation.

### **3.1 A powerful trading country is firstly a large economic country**

The level of trading matches with the national economic strength. A country with a relative strong economic strength and suitable international trade dependency, will not strongly influenced by fluctuations of world economy, will not lose the leading role of trading on the economy. Furthermore, international trade will bring a positive impact on domestic industrial upgrading, which provides the implementation of trade policy a strong guarantee. China has become the second largest economic entity, but the per capita GDP does not reach the medium-level developed countries, so China does not belong to the powerful trading country.

### **3.2 The products outputting form powerful trading countries are mainly high value-added products and services products**

Powerful trading countries provide more competitive products, more likely to focus on trading of service products, and have strong influence on world trade. Powerful trading countries mainly import primary products, and export high value-added products. They rely on a highly developed service industry to extend their services to global chains, and control the value chains, to maximize national interests.

### **3.3 Powerful trading countries have many aspects of national competitiveness**

Powerful trading countries make multi-trade zones to resist risks. They have well-known multinational companies to form the country's microeconomic competitiveness which create a trade advantage by direct foreign investment and attracting foreign investment.

### **3.4 Powerful trading countries have the right of speech in international trade**

Powerful trading countries participate in the formulation and revision of the international trade rules, practices and standards. They have a certain discourse initiative in the international trade arena. By playing an important role in the formulation and revision of the rules, practices and standards, powerful trading countries obtain a favorable position to achieve a win-win situation in trade activities.

## **4 Constructing Cultural Soft Power of our country and Enterprises is the fundamental Way to be a Powerful Trading Country**

Soft power is relative to the material aspects of so-called "hard power", which is proposed by American Joseph Nye in the early 1990s, the so-called soft power is a country's cultural power, which includes three kinds of powers, the cultural attractions of the country, the country's political values, foreign policies with legal and moral authority. "Hard power" is manifested by economic, technological, military, while soft power is reflected by cultural, educational, ideological, political values, the National Literacy, which together constitute a country's comprehensive national strength. China can take the following specific approaches to enhance state soft power to achieve the strategic goal about being powerful trading country.

### **4.1 Change consumption ideas positively, stimulate domestic demand, enhance the strength of domestic trading**

Guiding and opening national consumer attitudes in order to stimulate domestic demand, and enhance the country's economic development efforts by the development of domestic trade, which will help to reduce the risk of domestic economy being influenced by international environmental impact. In addition, the appropriate guidance of the concept of people's spending could promote domestic industrial structure upgrading. For example, when the concept of low carbon environmental enjoys is supported popularly, people will reduce the consumption of products which consume a lot of resources, seriously pollute the environment. So the related production will be inhibited, and the resources are transferred to the industries of high-tech alternatives.

### **4.2 Integration of a wide range of educational resources, and constantly improving the quality of people's culture**

Improving the quality of national culture is helpful to shape the national cultural image, enhance the national reputation and establish a good relationship in international trading. Improving the quality of national expertise could help to change the situation that simple processing is in the dominant situation of China's international trade patterns, increase the technological content of export products,

and establish brands advantages, then to form the core culture-based competitiveness. The improvement of independent innovation capability also makes our rising position in the division of labor in the industrial chain, to improve foreign trading benefits of our country .

#### **4.3 Strengthen China's excellent traditional culture inheritance and dissemination**

Making the excellent traditional culture as a carrier is good to spread country's good image, strengthen national influence, to fully tap the intangible value of culture. At present, China's total exports and scale of cultural products are very small, the export channels very limited, the operating mode very simple. Because of China's rich cultural connotations, we can select the dominant species from them, focus on them to strengthen the brand, and encourage the diversification of its export content, or even make the product groups. About export channels, we can make full use of the Information Society advantage through the network platform, the formation of professional overseas distribution company, or rely on international distribution network that other countries establish to expand the scope of the spread of our culture. As an important part of the global trade in services, the prosperity of the export of cultural products is conducive to improve the product structure in China's international trade, improve the proportion of China's service exports, enhance national influence, and narrow the gap with trade powers.

#### **4.4 Strengthen international communication, build a good culture image of our country**

A country's cultural tradition is directly related to the country's foreign policies and the relationship with other countries. Establishing and disseminating the culture which is compatible with the development of national international trade, has positive and beneficial effects on the development of national international trading. In the 2009 Summer Davos Forum, Premier Wen Jiabao pointed out China's soft power is to respect all countries, especially developing countries, least developed countries, and try to help them when making our own development. Interpretation of China's soft power from Premier Wen Jiabao makes people understand the cultural values of China's friendship and respect of other countries, especially weak countries, which is conducive for China to gain more support in international trading activities. One nation alone can not accomplish these things, such as the expansion of trade areas, the establishment and operation of multinational corporations, fighting for right to speak on the development of the international trading system, rules and so on, we all need to find a community of interests and gain certain support from them, and these all need to strengthen the international contacts, establish a good image of the national culture.

## **5 Conclusion**

Trade is essentially a redistribution of resources, trade among countries is not only mutual exchange, is the redistribution of resources among countries. Therefore, trading among countries is the only way to realize the balance of resources and development. Facing the increasingly rising of labor costs and resource costs, price-competitive having to deal with more and more international trade disputes, we must achieve the transition from a large trading country to a powerful trading country, using the soft power of the state and enterprises to be a powerful trading country. First of all, we must change consumption ideas positively, stimulate domestic demand, enhance the strength of domestic trade; Secondly, integrate various education resources, and constantly improve the quality of Chinese culture; Thirdly, strengthen the inheritance and dissemination of China's excellent traditional culture. Finally, we should strengthen international exchanges and establish a good international image. Otherwise, we can't establish a powerful trading country, can't achieve a sustainable development of China's national economy more fastly.

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# The Enlightenment of China's Religious Resources to Management Innovation

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**Abstract:** This paper, in use of deduction and induction of philology, puts forward the view that management innovation can draw nutrition from Chinese religions. China's religions mainly include Buddhism, Taoism, Confucianism, Zen, Christianity and Islamism, The Taoist view "doing nothing" and "nature" thought, the Buddhist thought "the law of mutual causation of all actions" does not disappear, but strengthen and change economic management. This paper gives the outlines of the general distribution of China's religious resources, provides a roadmap of beneficial enlightenment of China's religious resources to management innovation, and points out the future development of the management innovation. The question is answered why dedication-orientated religion enjoys more longevity than the profit-aiming company. The paper will have good auxiliary function to the different levels and different stage of management innovation.

**Key words:** Management innovation; Religion; Resources; Righteousness; Nature; Lao-tzu

## 1 Introduction

As an organization form, religion is the most ancient group, which shows a lot of advantages: First, the expansion cost is low and it doesn't cost the headquarters money to build temples and each does their own. Second, it has no brand director, no religion saying it has a brand director, but the brand image is very consistent. Third, there are no very clearly-disciplined oversight mechanisms, and religion is supervising agencies for the afterlife with no cost, no need to raise people but with good results. Finally, the reputation and complaint of board is zero. You ask Avalokitesvara for offspring and finally give birth to a daughter. Do you go to destroy the temples? No, you donate money again and go back home to regenerate. If you analyze religion form, you will find that the organization exists in dispersed molecular state, coordinates with values and bears its own cost. This kind of organization behavior has low cost, effective result, and great economic benefit. From this perspective, the religious organization has a massive boost space to be researched to cultivate the sense of value of enterprise organization.

## 2 Research Status Quo

There are many achievements about Chinese philosophy of three religions in enterprise operation and management, innovation at home and abroad. From magazines or newspapers, you will find numerous papers related to them. Especially at the practical level, you will find more about them. Because there is a deep relation between the three Chinese religions, philosophy and Chinese culture, the three religion-related philosophy schools has special relationship with today's many popular phenomena. In addition, because the use of the noun is different, it shows that the name is different but the sense is the same, such as "Studies of Chinese ancient civilization" and "Oriental wisdom". In fact, they are based on the three religion-related philosophy schools.

There are many examples about Movers and Shakers, Mr. Rongjin Ge in his paper "Chinese philosophy wisdom and modern enterprise management". Many people talk about Confucianism management, such as Taiwan Scholar Mr. Shijiang Zeng in his paper "Blue Ocean Strategy"; Mr. Deyi An (From Wuhan) claims the relationship between Confucianism and business management. In terms of Buddhism, Mr. Dayuan Shi writes "Zen and the modern enterprise management" series of published books; Mr. Guoning Shi and Mr. Juezhen Shi deliver many speeches in public, advocating that the people should use the spirit of "out of the world to go into the society"; Peter M. Senge's book *The Fifth Discipline: The Art & Practice* is the guideline of enterprise management.

In terms of Taoism, Chinese well-known entrepreneur Mr. Ruimin Zhang, Mr. Yongxin Xue, advocate Taoist management thoughts, using Lao Zi's wisdom to get the enormous success of enterprise management. Mr. Ruimin Zhang has a motto to remember: one is the "all things come from the way, and the way comes from nothing, "and the weak overcomes the strong". Similarly, Japan, the United States and other western developed countries to praise highly of Taoist culture make Taoist thoughts

shine more brilliantly. The flexible management model in Japanese enterprise fully absorb the Laozi's water-like management. The Chinese scholar Tang Xiaofang discusses about the Taoist influence and function in the enterprise management in her course "the way of management". In Management innovation, there have been many discussed research programs. In the paper "Enterprise technology innovation and management innovation the coordination effect of research", Mr. Sun Jiang and Mr. Yang Yimei from Wuhan University of Technology, tells us that in the knowledge economy era, the innovation is important factor, which enterprise forms the core competitiveness and keeps the competitive advantage, and is also access of the enterprise survival and development. It also discusses about the connotation and characteristics of the technology innovation and the management innovation, and probes into the synergy of how to accurately grasp the technology innovation and management innovation.

Xue Jie from South China Normal University in "Management innovation concept and its formation mechanism", analyzes the connotation of the concept of management innovation from three perspectives: the content, the novel degree and purpose innovation. According to the enterprise internal evolution's point of view, based on the motivation, inventions, implementation, theoretical and communication, the research constructs the generating mechanism of management innovation of the conceptual framework, highlights the status and the interaction between the internal change subject and external change subject, and analyzed the ten key activities of the management innovation in the process of generating.

In short, there are many academic thesis. This is just the tip of the iceberg.

### **3 The Value and Trouble of the Management Innovation**

There are a group of well-known numbers. Apple Iphone can make \$187 from a mobile phone. and America, Japan. Korea and Taiwan engaged in the production of hardware get \$187, and China's mainland working on the assembly only gets \$6.54. Since 2006, Foxcom, the largest generation of label enterprise and Apple's biggest foundry enterprise has decreased its profit. The distribution profit of Iphone is 20% in Taiwan and 30% in the United States. This comparison proves an intentionally ignored fact that innovation consciousness, conformity ability and manufactory plants are in completely different status in the global industrial chain link.

Innovation is always risky. How is innovation to develop steadily? It is common that there exist monasteries for thousands of years, but it's rare that an enterprise can remain for hundreds years. According to a report, in America, about 62% of the enterprises lasts less than 5 years. The average life expectancy of small- and medium-sized enterprises is less than 7 years, the multinational company 10 to 20 years, and the global 500-strong enterprises 40-42 years, the top 1,000 enterprises 30 years. Only 2% of the enterprises live up to 50 years. But in Japan, the average life of a company is 30 years and only one enterprise has always ranked the top. It shows that company of China can last 7 to 8 years, the average life of small business as 2.9 years, and about 1 million enterprises closed down annually in China.

In order to improve the efficiency of the organization, our revolution is also going on. So how to change? There are two directions. One is religious organization, while the other special efficiency will be very high. Of course, the power and efficiency of this organization belong to the extreme example of religious organization.

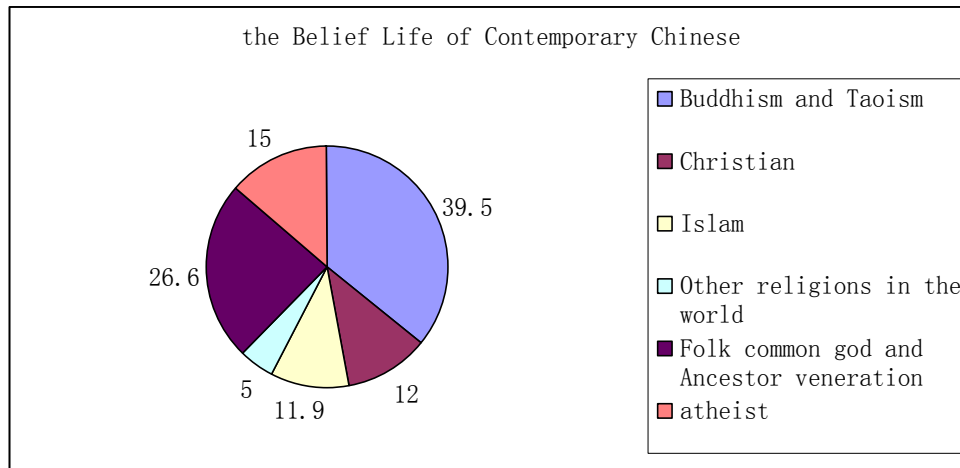
## **4 Enlightenment of Chinese Religious resources to the Management Innovation**

### **4.1 The Belief Life of Contemporary Chinese**

According to the research of the implementation of the investigation in the summer of 2005, in the age of 16 years old and above of the Chinese people, with the number of religious belief is 31.4%. So, China has the religious beliefs of the population of about 300 million.

From the survey result, Catholic, Christianity, Islam, Buddhism and Taoism audiences account for 67.4% of the total, up to an absolute majority, a belief in the world of other religions of the 6%. In the survey, Buddhism, Taoism and folk beliefs add up 66.1% of the total, if on the total population, approximately 200 million people. For many years, the fastest growing Christian, In this century, s reach 16 million.





#### 4.2 The confucian philosophy of righteousness to the enlightenment of the management innovation

The representative figure of Confucianism is Confucius and Mencius, and the representative book is “the four books”. The representative speech (core value concept) is “benevolence”, “loyalty”, expansion of a “etiquette”, “wisdom”, and “faith”.

The TV series “family yard of Qiao” is our familiar programs, and with the program broadcast, Shanxi Province businessman returned to the audience view. There is a comment in CCTV documentary: Confucian requirements of “faith” and “loyalty”, traders in the activities were not abate, but get more strengthen, this gives us a warning: people often consider “loyalty” and “benefit” as the conflict, especially the Confucian classic “university” having such a word: “When money is scattered, the people gathered. When wealth gathered, people scattered...the ruler who gather wealth must follow the petty man... That is to say, the country is not for profit, but with righteousness as interest”. It often misleads us for: if you have loyalty, you won’t earn money; If you have good faith, you will lose benefit. Shanxi businessman’s practice of case tells us, loyalty can maintain long-term peace and stability and faithless business activities are very easy to cause the enterprise of loss and direct and indirect loss. Reflected from the Daxue (Rite, one of the Four Books ) tends to “justice” and intent, we will see that leaders should not struggle for profit with subjects and people, whereas for the businessman, business is business, it’s extremely legitimate. If your position and angle is different, you will have different conclusions.

Yoshitaka Kitao, the famous Japanese entrepreneurs, studies ancient Chinese philosophy and applies it to the modern enterprise management, and wins a great success. The main works are “the create value “business”, “create characters”, “from China’s ancient books get incredible power”. In a book the authors said: “I have great respect for the entrepreneurs Mr. Wade Ze, because he had combined moral with economy. The core of the doctrine is: business should be based on love. He gets abacus on the left hand, and “the analects” on the right hand, which has been called a right value in economy world.

He had been established more than 500 enterprises in Japanese capital market development period of high-speed growth age. So many established representative enterprise of Japan are associated with him. On one hand, he dives into the Confucianism, digests the Confucianism thought and theory, and corrects ethical values widely used in economic business expansion. On the other hand, in the scientific management field, he explores double-entry accounting in Japan. So, the true sense of the successful career should be the faith. And, this applies not only to enterprises, but also suitable for the state, the society, or any organization.

“We get the ethical values from” the analects, like three words: “benevolence”, “loyalty” and “faith”. The ‘aith’ is never regretted; the loyalty is doing the right thing; the “benevolence” is to stand in the other side to consider.

The success of Japanese enterprise is just the tip of the iceberg, from which we can know that the economic development background of the four small Asian dragons. They are in Asian Confucian cultural circle. So the Confucian culture plays an important role on the Asian economic development. But the strong condemnation of Confucius in 1971 during China’s “ultural revolution” almost led to breakdown of the national economy.

#### 4.2 The enlightenment of Taoist "Tao Te" to the theory of management innovation

When the chief Editor of "si ku quan shu" by Ji Xiaolan speaks of Taoism: "It's pretty subtle while it contains hundreds of theories". The representatives of Taoism are Laozi, Zhuangzi and Lieh-tzu, and the representative work, which is called in different names. The representative philosophy of Taoism is "Tao". "Tao rules nature", and Tao here refers to nature, the origin and crude in accordance with nature. In that case, obeying the rules of nature stands for virtue, and virtue can be shown in Tao, while Tao can be seen in virtue. However, this concept is different from the later morals in "ethics", which considers people who are nice and does good deeds. Tao can be good, evil; It can also be Yin, or Yang; It exists, and can also be nothing, as we just have to define.

People often associate Tao with words like "the fairy", "be divine", "be alive forever" and so on, which contains very deep ethics, but we are not going to talk about it. What does the Taoist doctrine contribute to the innovation of management? You don't know if you make no research. Let us just take two cases as example.

The Taoist (Lao zi) system contains rich and sophisticated management wisdom, which still has a unique and profound influence on the management of modern enterprise today. Lao Zi didn't elaborate something related to problems of enterprises. Just because of this, we have enough space for thinking, we should combine the Taoist spirit with modern enterprise management, combine the Oriental traditional culture with western modern civilization, take good for the bad, and walk into a distinctive way of modern enterprise management.

Giving an example, Feng Lun said: "I am zero".

As a boss of a famous estate, why is Feng Lun so moderate? "Ancient wise man often said, the water is so low that many things will come to it." Feng Lun began to concentrate on studies of history and philosophy from high school, and he stands in an ancient angle to think in a philosophy way. "Those who think they grow from zero into 1, into 100, are the man who overlooks history and time. If you look at history based on the vast infinite universe, people are actually extremely small. I think I'm actually nothing a '0'. Zero is zero, and zero can be nothing, as well as all."

The "Washington type" withdraw let Feng Lun totally retreat from Wantong Company, thus avoiding the bottleneck brought about by the enterprise founder's limitations of perspective, economic idea and health, and thus breaking down the threshold which most enterprises can never overcome in a 15-year's life cycle. And it gives him "a looking back opportunity" to Wantong Company.

The management philosophy "Not to last" refresh the enterprise. "I am zero, and zero isn't aggressive. So I can simply get along with friends, and usually it can last long." The core value that FengLun gave Beijing Vantone Real Estate Co., Ltd is simply four characters- "keeping and be surprising".

So what does it say in Taoist classic *Lao zi*? "the river carves out the valley by flowing beneath it. Thereby the river is the master of the valley. so the popularity of the sage does not fail, he does not contend, and no one contends against him." "Do not control the people with laws, nor violence nor espionage, but conquer them with inaction."

In addition, why is Li Ka-shing's industrial enterprise named after "the Yangtze River"? it also originates from the same philosophy. The great minds think alike.

#### 4.3 Enlightenments of Buddhist wisdom to management innovation

The creator of Buddhism is of the Indian Buddha, but Buddhism could not pass down in India, while China inherited this and carried it up, letting it combine with the Chinese culture, and thus forming Zen. Buddhist's representative theories are "four noble truths" and "twelve principal and subsidiary causes", with its core of "Cittamatra".

The core of management is the people, while the core of the management innovation is the development of hearts. The enterprise's personnel resources are simply classified into three types: First is the open of hearts, the consciousness of wisdom, which produce creativity; Second is the development of staffs' hearts, which creates enthusiasm; And third is resultant force produced both, namely the cohesive affinity and centripetal force of the enterprise itself. Unity is strength, which produces the soil of innovation.

The most representative theory is "directed at heart" from the Zen: run hearts rather than run products.

## 5 Conclusion

All in all, this paper thinks respectively from Confucianism, Buddhism, and the philosophy of the

Tao, combining with the innovation of enterprise management of the real cases, elaborate the beneficial enlightenments that Chinese religious resources bring about the innovation of management. Furthermore, the demands for the internal upper, middle and lower employees of the enterprise are different. Scholars think that the low-rank leaders should learn from the legislator school, following rules; that the middle-rank leaders should learn from the Confucian, following faithfulness; and that the upper-rank leaders should learn from Daoism, emphasize on changes and consequences. And we should also use different changes in different stages of management innovation. These will be our direction of next research.

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## The Construction of University Marine Culture Core Value System: From a Cultural Management Perspective\*

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**Abstract:** Constructing university marine culture core value system (UMCCVS) which aims to cultivate marine talents plays a significant role in the development of shipping business. However, few scholars at home and abroad have studied on this system. From the angle of cultural management, this article constructs UMCCUVS from 4 aspects, namely: substantial, behavioral, institutional and spiritual levels, and then discusses significance, connotation, characteristics, functions, construction approaches and goal of this system, which not only fills vacancy in this field theoretically but also serves as a reference for contemporary marine education.

**Key words:** Culture management; University marine culture; Core value system; Outstanding marine talents; Human—oriented thought

### 1 Introduction

Organisational culture management originates from the field of corporate management. But in our domestic studies, it has already been successfully applied into school management, and has exerted its educational function. Although university has its unique features, it shares the general features of an organization. Therefore organisational culture management is important theoretically and practically for exerting university culture's educational function.

University education highlights "human". Making human-oriented thought as its kernel, university cultural management can better satisfy peoples' self-realization needs than previous rational systematic management. University marine culture is an important part of university culture, which has common features of university culture, as well as the distinct characteristics of marine industry. However, contemporarily none research has been done on university marine culture, and not yet in university marine culture system theoretically, which leads to a series of problems unsolved in marine education. Therefore, this article, from the cultural management perspective, puts forward UMCCVS and makes a reference for cultivating outstanding marine talents and exerting culture's educational function.

The main achievements related are reviewed as follows:

1. Study on organisational culture in universities reflects western educational management in the mid 1980s focusing on subject values and beliefs, and emphasizing the trend of training cohesive force among organisational members and forming organisational culture (Bush, 1995).

Many authors have defined organisational culture over the last 30-40 years and as a result, the variety of approaches and definitions of organisational culture is considerable. It can be said that organisational culture is a diverse phenomenon that can take on different roles, perform different functions and be expressed in different ways.

Aboard studies of organisational culture in higher education flourishes thanks to overwhelmed highlights on this theme since 1980s. Making a literature review, major studies focuses on: 1) collegiate administrator perception on organisational culture (Felice, 2011); 2) culture categorization and analysis (Berquist & Pawlak, 2008; Kuh & Whitt, 1988; Clark, 1980); 3) institutional culture and subcultures (Kuh & Whitt, 1988; Masland, 1985; Adrianna & Peter, 2002); 4) culture framework or model (Tierney, 1988); 5) cultural assessment practice (Barbara et al., 2010); 5) indicators and approaches of organisational culture in higher education (Masland, 1985); 6) query on culture in higher education (Silver, 2003); 7) the relationship between culture and institutional transformation or change process (Keup, 2001; Adrianna & Peter, 2002)

The book "Cultural Perspectives on Higher Education" examines a range of cultural studies esp. making an overview of the history of cultural approach in higher education (Valimaa & Ylijoki, 2008). Among all these ideas, the voice against the "monolithic entities" view of higher education institutions emerges. Higher education institutions are fragmented into innumerable "small worlds" divided along the lines of disciplinary cultures, institutional traditions and resources, and the national systems of education (Clark 1987). The book "Academic Tribes and Territories" (Becher, 1989) has been

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forerunner in creating a possibility for understanding the different “small worlds” of academia, namely, disciplinary cultures in future study, laying a basis for one of the popular cultural frames in the analyses of higher education.

2. As a kind of flexible management strategy, organisational culture management theory has completed the expansion from corporate management into school in China (Wu et al., 2006). Among the studies, the idea viewing school culture as a management theory is the product of accepting the western culture management theory. Along with the further enforcement of higher education reform, university culture management gradually becomes a common concern. Some universities emphasizing cultural forces and influences regard cultural construction as the current and future strategic task. Main research involves the following aspects: 1) Concept of university culture and its realization; 2) The trend from systematic management to cultural management in university; 3) The basic characteristics of university culture management; 4) Key elements of university culture management; 5) Connotation, strategies, principles of university; 6) Roles, trends, and strategies of university cultural management.

3. Through the current literature review, it can be found that study on culture management in university has aroused scholars' attention, with numerable fruits obtained on organisational culture in higher education institution, organisational culture managerial performance, etc.. But researches have some limitations: 1) not involving a specific industry with no connection with a certain industry's culture. Contemporarily, study on university marine culture at home and abroad remains blank. Rare study has been done relating outstanding marine talents to university culture and marine culture, let alone forming a system; 2) no considering the educational function and platform of university culture management. Besides university marine culture, the combination of university culture and marine culture, has received rare attention. Study for constructing UMCCVS and educational function of university marine culture lag far behind.

## **2 University Culture Management and Outstanding Talent Cultivation**

### **2.1 Introduction to the theory of organisational culture management**

The theory of organisational culture management dates back to the 1980s, marked by the book “Corporate Cultures: The Rites and Rituals of Corporate Life” coauthored by Terrence Deal and Alien Kennedy. Thereafter, cultural management theory has been widely used in corporate management practice with great success.

However, Organisational culture has been criticized as being conceptually weak, since it has been defined in many ways (Jelinek et al., 1983) and each definition emphasizes a particular focus or level. Among the practitioners, Schein was an especially influential scholar for his conceptual framework for analyzing and intervening organisational culture. Schein (1992) regards it as a multidimensional and multilevel concept by describing three levels of culture. The first level consists of visible organisational structures and actions, such as dress code, facilities and procedures. The second level consists of espoused values manifested in the public images of organizations, such as strategies, goals, and philosophies. The third level consists of basic assumptions, or unconscious beliefs, perceptions, thoughts, and feelings. These determine both behavior norms (the way people should behave) and organisational values (the things that are highly valued). Buono and Bowditch (1989) holds that the visible elements created by an organization on the first level are treated as objective organisational culture, while the elements on the second and the third levels are concerned with subjective organisational culture.

Studies have shown that organisational culture is a unique way of thinking, ethical style, value and norm of behavior widely accepted by members of the organization which are gradually created and formed in the process of social practice in a certain social, political, economic, and cultural background. Broad organisational culture includes not only the spiritual form, but also the physical form. Organisational culture has the following features: 1) It focuses on the values and beliefs of members of organizations; 2) It emphasizes the development of shared norms and meanings; 3) Culture is typically expressed through rituals and ceremonies which are used to support and celebrate beliefs and norms; 4) It assumes the existence of heroes and heroines who embody the values and beliefs of the organization (Bush, 2003). Culture Management theory shows how to affect an organization's culture to achieve the purpose of effective management of the organization, which is a supplement and improvement of the empirical management and systematic management theory (Wang, 2008).

### **2.2 The concept and role of university culture management**

Cultural management theory regards “human” as its fundamental factor and main concern. Therefore, this article holds that university culture management is the highest level of human-oriented

management, with its nature which takes human's overall development as the goal and creates a healthy and harmonious cultural atmosphere by means of substantial, institutional, behavioral, spiritual culture's combined role so that the staff and students would involve themselves into it and change from being management to self-restraint, which maximizes individual and social value thus finally achieves university's mission of shaping people. The roles of university culture management are as follows: 1) The guiding role. Making clear purpose and values of the university; 2) Encouraging function. Meeting the spiritual needs of human self-realization; 3) Cohesive function. To be cohesive to improve the university's self-worth and social value; 4) Shaping role. To create a good environment to improve people's sense of shared responsibility. 5) Radiant role. To establish a good social image of the university.

### **2.3 University cultural management and outstanding talents cultivation.**

The core content of university cultural construction and its main objective is to cultivate outstanding talents. University cultural management should be "human-oriented" to develop functions of guiding people, inspiring people, shaping people, uniting spirit, and establishing image, thus maximizing the social and individual values of university. Among the studies of outstanding talent cultivation, Wuhan University of Technology has established an outstanding talents cultivation system with "outstanding pursuit" and "outstanding capability" as basic features, which refines the standards of outstanding talents cultivation and shows direction for university culture management applying into outstanding talents cultivation.

At the same time, it should be recognized that different disciplines and specialties with characteristics reflects the industry demands. Industry's specific culture also proposes corresponding requirements for outstanding talents cultivation. So the integration of industry culture into university culture and the research of university culture with specific industry feature would provide more help to the talents cultivation in this industry. Therefore, on the basis of university culture and marine (industry) culture, the construction of UMCCVS plays an important role in outstanding marine talents cultivation

## **3 The Construction of University Marine Culture Core Value System**

Distinctive characteristics and its interaction with industry culture are the salient features of the university culture. This is due to the fact that different industries have different personnel demand and cultural heritage which requires unique hardware facilities, institutional culture and spiritual culture in university. These "different" and "unique" consist distinctive featured university culture. University marine culture is an important component.

However, as a navigational strong power possessing numerous seafarers and many marine universities and colleges, China has not established a complete university marine culture system in theory. This is due to the fact that, for a long time, most maritime colleges lack cognition and attention to marine culture reflected by limiting its purpose to developing navigational major courses and specialties, while ignoring integrity of university marine culture as an organic entity. The lack of university marine culture results in a series of realistic problems, for instance, lacking professional identity and interest, seaman's frequent job changing; no correspondence between student education mode and industry demand, etc. Remaining a bottleneck, these problems directly affect China's advanced seafarer supply and quality. Therefore, the construction of UMCCVS has vital theoretical and practical significance

Study on university culture and marine culture can offer some ideas to construct UCMCCVS. Through literature review, different opinions with different expressions can be found. University culture as a particular form of organisational culture can be defined "as the collective, mutually shaping patterns of norms, values, practices, beliefs, and assumptions that guide the behaviour of individuals and groups in an institute of higher education and provide a frame of reference within which to interpret the meaning of events and actions on and off campus" (Kuh & Whitt, 2000). William H. Bergquist & Kenneth Pawlak proposes six different, yet interrelated, cultures found in North American higher education: collegial, managerial, developmental, advocacy, virtual, and tangible culture (Berquist & Pawlak, 2008).

While the term organisational culture is used as if an organization has a monolithic culture, most organizations have more than one set of beliefs influencing the behavior of their members (Morgan, 1986; Sathe, 1985). The same phenomenon occurs on higher education with various collegiate subcultures. Cultural diversity appears to be more obvious in higher education institutions (Kuh & Whitt, 2000). As institutions and systems of higher education expand, academic culture tends to fragment.

Clark (1972) noted that institutions of the higher education may actually move from “integrated academic culture” to the “many cultures of the conglomeration”. Thus, university as an institutional entity clusters a series of subcultures reflected in various functional sections, which avails university marine culture a reasonable and feasible basis.

However, on the understanding of major views, in this article, university culture can be defined as the synthesis of value notion, behavior criterion, language habit, knowledge symbol, institutional system, regulation standard, campus construction and fund support with distinct comprehensive and educating features in the process of teaching and supervising through knowledge inheriting, sorting, exchanging and innovating. Marine culture is still a vague concept. Based on domestic research, marine culture can be defined as a synthesis of value notion, behavior criterion, supervision system, institutional regulation, business operation, knowledge skill, marine system, and fund support in accordance with the industry’s particularity and marines’ standard, professional, comprehensive quality, as well as responsibility and quality awareness gradually formed by marine organizations and individuals during the process of management and operational activities in marine circle.

Merging marine culture into university culture, the article tries to construct UMCCVS shown in Figure 1:

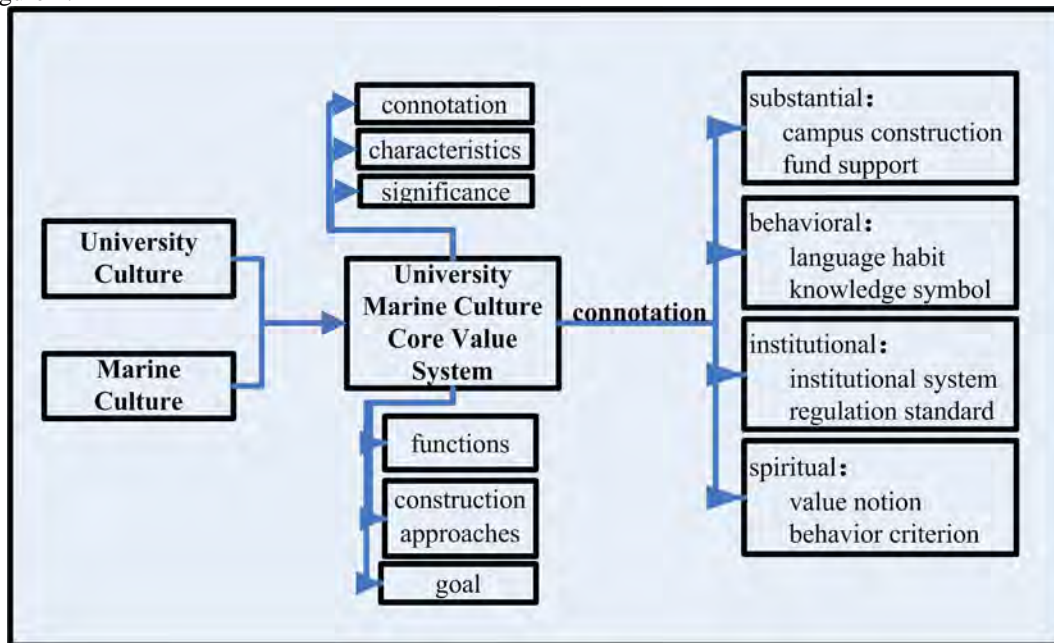


Figure 1 Structure of UMCCVS

**3.1 The significance of university marine culture**

University marine culture is of theoretical value and practical significance. The study on university marine culture may supplement university marine culture system theoretically, and play its roles, for instance, culture’s educating role, which helps solve many troubles caused by the notion of emphasizing professional skill while ignoring culture construction.

**3.2 The connotation of university marine culture**

At present, study on university culture and marine culture focuses on their concepts, roles etc. Based on previous analysis, this article suggests that university marine culture may be defined as integration of university culture and marine culture, in detail, a synthesis of value notion, behavior criterion, institutional system, regulation standard, language habit, knowledge symbol, campus construction, fund support which is a reflection of merging marine culture into 4 aspects of university culture, namely, substantial, behavioral, institutional and spiritual levels. For outstanding marine talents cultivation, university marine culture should satisfy the following 4 requirements: 1) having basic conditions and guarantees for cultivating talents meeting industry’s demand; 2) performing knowledge transfer and communication for improving industry quality and overall quality; 3) possessing a behavior system reflecting combined spirit of university and marine industry; 4) constructing regulation system reflecting marine industry’s particularity and university’s routine management.

**3.3 The characteristics of university marine culture**

University marine culture has common features of university culture and marine culture: 1) Quality foremost. To guarantee marine education's standardization, professionalism, comprehensiveness, a complete quality standard should be established. For example: maritime education and training quality system; 2) Distinct characteristics. According to the industry requirements, featured education and management pattern should be formed. For example, specialty setting highlights international standards.

### **3.4 The functions of university marine culture**

1) Marine culture inheritance. A main approach to cultivate talents is knowledge transfer and culture influence; 2) Marine cultural innovation. University marine culture helps urge exchanges of new ideas, knowledge and skills, thus improving industry's advance; 3) Marine culture pioneering. It mainly reflected by serving a culture pioneer in university, and industry, and broadening external communication.

### **3.5 The construction approaches of university marine culture**

It lies in exploring the realizing methods of outstanding marine talents cultivation from culture's educating angle, in detail, constructing marine culture's educating mechanism from 4 aspects: substantial, behavioral, institutional and spiritual aspects, and constructing marine culture's educating platform from 4 carriers: teaching and training, quality-oriented education, industry practice, and educational management.

### **3.6 The goal of university marine culture**

The goal is to maximize the value and function of university marine culture, thus improving comprehensive development of university, society and marine industry.

## **4 Conclusion**

Constructing UMCCVS is rather important for playing culture's educating role in respect of outstanding marine talents cultivation, as well as serving a reference for marine education. This article puts forward UMCCVS, a theoretical attempt, from the cultural management perspective as a reference for cultivating outstanding marine talents and exerting culture's educating function. But there remain weaknesses: 1) The study is not deep; 2) It lacks of empirical study. Future research should 1) make an in-depth research on UMCCVS by examining it in practice; 2) make a survey of marine industry's personnel demand, and continue exploring university marine culture's educating functions and methods.

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## How to Construct “Living” Enterprise Culture?

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**Abstract:** This paper try to give an answer about how to construct “living” enterprise culture via criticizing and analyzing the formalistic enterprise culture. Through case study and literature analysis, the author offers four steps about constructing living enterprise culture: firstly, forming people-oriented awareness; secondly, understanding the value of enterprise ethic; thirdly, attaching great importance to traditional culture; fourthly, protruding the character of enterprise culture.

**Key Words:** Enterprise culture; Living; The character of enterprise culture

### 1 Introduction

In modern world, culture, economy and politics intermingle with each other, playing a more and more important role in competition of comprehensive national strength. As to a country, culture can create productivity, improve competitiveness, enhance attraction, and form cohesion (Matsumoto, 2009), which is related about the foundation of our country, our statecraft and way to develop our country. For the same reason, the effect and impact of the enterprise culture to an enterprise is self-evident (Merrill-Sands & Holvino, 2000). It is an important question how to construct a true “living” enterprise culture system. Through case study and literature analysis, this paper explains that how to construct a “living” enterprise culture.

### 2 Forming People-oriented Awareness

Human is the most positive, active, subjective factor of the production factors. The traditional Chinese culture has had the gene of people-oriented awareness. The ancients had realized the importance of human early: Zhen Guan Dignitaries recorded, “Water can not only carry the boat, but also can overturning it”, which refers to the principle for the feeling of the public. Liu Bang, first emperor of Han Dynasty, said “When it comes to the question of devising strategies within a command tent and deciding how to win, I am no match for Zhang Liang; when it comes to the question of governing a country, placating the citizens, raising military fund, dredging the food road, I am no match for Xiao He; directing millions of soldiers, winning every war and getting every city we want, I am no match for Han Xin; they are all extraordinary person, but they all listen to me, that is the reason why I can be the emperor of the country.”(Si Maqian, 1550)

As the development of our society, people-oriented awareness gradually becomes the symbol of civilization progress, and the modern enterprise has changed their way of object-oriented management to people-oriented management. People-oriented management asks the manager to regard the employee as the most important resource, and scientifically arrange one’s work as the employee’s ability, specialty, interest and mentality as well as considering the employee’s growth and values enough, respecting the employee’s personality and independent character. It can be done as the following aspects in detail.

Firstly, respect and care for the employee. Respecting one person is very important for association and management. In this aspect, MOTO, HP are the successful models, and respecting everyone is an important character of these enterprises’ enterprise culture. Human is the most emotional animal and needs others’ respect and trust. The enterprise should respect and trust the employees, regard them as friends who can be relied on, help them establish self-esteem and self-confident, and give them space to grow and develop. For example, if an enterprise bravely promotes the managers above middle-level in several years: two employees being promoted as vice-presidents, five employees being promoted as division managers, four employees being promoted as business supervisor. According to this way, it improves not only the cohesion of the enterprise, but also the competitiveness. Having the foundation of respect and trust, the enterprise should also start from preserving the employee’s interest and care for the employees truly via tangible action. For instance, an enterprise provides not only “Five Insurance and One Fund”, but also health care benefits to the employees, as well as giving them weekends and legal holidays liking the treatment for civil servants, so that the employees can feel that they are valued, respected. Therefore, the employees will see themselves as the host of the enterprise, and consciously connect the fate of the enterprise with their own career and future so that they are willing to devote all their working enthusiasm to the enterprise.

Secondly, found high-efficiency communication mechanism. In modern society, employee's emotional requirement becomes more and more strong, and a favorable communication mechanism is the foundation to fulfill this kind of requirement. Above all, an enterprise should found efficient way for communication, if the enterprise wants to have a high-efficiency communication mechanism (Hui, 1990). Besides, the enterprise should strengthen the communication between employees and the organization. The essence of communication is delivering and understanding, sharing the information resource, not negotiating and introducing. As a senior manager, if one can form a favorable listening habit, usually listen to his/her subordinates' sound, realize their requirements, and try his/her best to solve the employees' problem from both work and life, he/she can tremendously improve his/her subordinates' working enthusiasm.

Thirdly, form a self-managed team. In the era of knowledge economy, the employees regard work as a choice of lifestyle, not just a way to earning their living. They hope to seek self-development and achieve self-worth. Their requirement for work autonomy will replace the traditional state of passively accepting what their superior ordered. The employees want to get more autonomous right in their work from the organization, to participate the decision, to understand more responsibility and challenging work, and to share more information with their superiors. It is an important way to fulfill this requirement to form a self-managed team. Therefore, we have successively founded project team, the pre-researching project team, and sales team, and these teams get a certain right to using people and fund from the enterprise. After making a trial, the team's whole efficiency gets a full play.

Fourthly, satisfy the employee's requirement of continuously learning. The successful enterprise in the future will be a "learning organization", and the employee's requirement of continuously learning will be over the requirement of payment as before so that it will be an important standard for the employees to choosing a job whether the organization can provide them the opportunity to learn continuously. An enterprise should found a learning organization to embody the people-oriented culture, and it is the main function of human resources department to provide the employees a system, long-term, targeted training and offer different training to different employees. It will have a more obvious effect, if the enterprise gives the employees relevant training about their professional knowledge every week.

### **3 Understanding the Value of Enterprise Ethic**

An enterprise's vitality is not only embodied in respecting people, but also reflected more in enterprise ethic which is the enterprise's foundation to survive and the most fundamental construction of enterprise culture. The effect of enterprise ethic is reflected in: firstly, found a friendly, harmonious, coordinately developmental relationship between society, environment and the enterprise, which is the requirement of both the development of modern society and market economy and the development of modern enterprise; secondly, enterprise ethic is indispensable for correctly handling of the internal variety of relationships, resolving the various inner contradictions, and enhancing the internal unity and cohesion; thirdly, enterprise ethic can stimulate the employees' positivity and creativity, change personal action from heteronomy to autonomy, which is in favor of the enterprise to remain invincible in the competitive market.

For this reason, we mainly start from the following aspects:

Firstly, set the ethic goal of the enterprise; stick to the right management idea and moral ideal; unify the economic goal with the social moral goal, the economic benefit with the social benefit; emphasize the responsibility to the society and people's livelihood.

Secondly, formulate the ethic principles embraced by the enterprise, which should be implemented in operation decision and every other important action of the enterprise. Formulating ethic principles is building the enterprise's moral standards so that the enterprise's moral culture can be founded on the base of concrete principles and the staff can have concrete moral standards to comply with. The enterprise should attach great importance to the balance between "Regimes" and "Morality" instead of simply relying on deducting wages, bonus and welfare to restrain the employees' action. An enterprise should respect people's emotion instead of regarding human as "economic animal". The employees should truly realize that an enterprise would lose its common goal and right behavior principles, if it only paid attention to material and money without mentioning any ideal and morality.

Thirdly, enhance ethical education for the employees to change personal action from heteronomy to autonomy. It can improve the employees' mental consciousness and moral level to cultivate the employees' favorable "morality", and on the contrary, it will make people's hearts slack, be short of cohesion, and make the benefit decrease. For example, since an enterprise was created, the employer has

always been sticking to provide “a presented language” per week, which is unconsciously influenced to the employees’ morality and behavior principles. This corporation also takes advantage of every festival in a year to make traditional moral education to the employees, such as “Teachers’ Day”, “Mother’s Day”, “Father’s Day”, and “Double Ninth Festival”, and so on, which receives a more obvious effect.

Fourthly, the leaders and layers of cadres in a enterprise should lead by example, integrating heart to heart with the employees to the emotional extent, and often be close to the staff, listening to their voice, observing their opinions, knowing their feelings, being familiar with what they think, and implement solving ideological problems to solving practical problems. In recent years, the ideological work is often neglected. We should do ideological work, and meanwhile, carry out moral education so that the employees’ sense of morality, responsibility and view of honor and disgrace can be enhanced, which can help the employees consciously accept the norms and constrains of the enterprise culture, manage and control themselves automatically in accordance with the enterprise culture, and abide by the enterprise’s every regime more consciously, changing from passive management to active management.

#### **4 Attaching Great Importance to Traditional Culture**

In the modern enterprise culture management, it is an important goal to correctly handle of the internal variety of relationships, to resolve the various inner contradictions, and to enhance the internal unity and cohesion. To achieve this purpose, every enterprise culture cannot be separated with its local cultural traditions. The famous Swiss psychologist Carl Jung once presented the theory of “collective unconscious” in *Theory Analysis of the Relationship between Psychology and Poetry* published in 1922 (Jung, 1970), thinking that people’s unconsciousness should be divided into two levels: individual and non-individual. The former only need the extent of the baby’s earliest memory, which is composed by impulses, desires, vague perception and experience, while the latter includes all the time before the baby actually exists, including the residues of ancestral life, which can be found in everyone’s heart and is universal so that it is called “collective unconscious”.

According to Jung’s theory, the residues of ancestral life is existing, so any nation’s traditional culture and civilization can exist in our life with a form of residues.

As to our Chinese people and enterprises, China’s traditional culture provides us with many “ancestors” that have ever affected us and the outstanding cultural foundation that still impact us:

For example, as a kind of traditional values, the Confucian thoughts of “Harmony is the essential part of ritual applications”, “Serve the sovereignty and the county” are to maintain social stability and group harmony for the purpose, which emphasize the individual interests should be subordinate to the overall interests and consciously put oneself to the group in order to maintain the overall harmony and stability.

#### **5 Protruding the Character of Enterprise Culture**

The enterprise culture is an enterprise’s unique mode of management in certain cultural background, and the enterprise’s personalized performance. Because different enterprises have different leaders, the enterprises’ business development and composition of ingredients are different. The enterprises have their own strategy to reflect the environment and way to deal with internal conflicts. As a result, different enterprises naturally have different enterprises cultures.

However, some enterprises cannot really understand their own enterprise cultures in the construction process of enterprise culture, blindly copying other enterprises’ ideas, guidelines, visions and forms, ignoring the individuality, characteristics and content of the culture in their own enterprise.

An authority figure of enterprise culture Edgar Shaw thinks: the core of an enterprise is basic assumptions, and then is the level of value, followed by the level of conduct principles and behavior mode. Enterprise culture is a kind of basic assumption to human nature, value and world view formed in the process of entrepreneurship and development of an enterprise, as well as a condensation of business philosophy created by all the entrepreneurs in entrepreneurial process. The enterprise expresses these values and theories via various activities and forms, and after that, an enterprise culture is formed which is fresh, individualistic, vitality and really belongs to its own enterprise.

#### **6 Conclusions**

The 21<sup>st</sup> century is a century of cultural management and cultural victory. Every enterprise operator must learn, close to, grasp, and practice cultural management so that the enterprise can longevous. Only by establishing the above principles for construction of enterprise culture can the enterprise culture be a

living system that really plays a management role.

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## A discussion of Management Mechanism Based on Marketing Channel Risk Conduction Mechanism

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**Abstract:** Marketing channel, as an important part of enterprises marketing activities, has the characteristics of externality and complexity, facing lots of risks in its operation. The marketing channel risk management has always been an important field in the study of marketing channel management. This paper firstly analyses the marketing channel risk conduction mechanism. Then it gives views that marketing channel risk conduction is a process that risk factors carried by risk conduction carrier move along the risk chain to risk conduction receptor directionally, causing a risk event, eventually leading to a deviation between marketing channel performance and anticipating goal. On this basis, this article builds a management mechanism on channel risk conduction with the core of risk conduction block, risk conduction channelizing and risk conduction loss controlling, which aims to provide beneficial reference for the study on marketing channel risk management.

**Key words:** Marketing channel; Risk conduction; Management mechanism; Normative analysis

### 1 Introduction

Marketing channel, the transferring route for products and services, is an important system for enterprises to transfer products and services to customers, gaining competitive advantages and profits. Due to the characteristics of subject diversification and interest decentralization, marketing channel is more vulnerable to the internal and external impacts of environment. Its operation faces more risks, and comparing with other marketing tools, it is more difficult to control. Hence, it has become an important issue of marketing channel management to research on marketing channel risk conduction mechanism, establishing appropriate risk management mechanism and avoid the risk of marketing channel effectively.

Domestic and foreign scholars have done a lot of researches on marketing channel risk. Gallagher(1950)proposed the concept of risk management in his article "Risk Management in the Business Enterprise". Serena Williams and Hans (1965) used probability theory and mathematical statistics to analysis quantitatively and evaluate enterprise risk in their book "Risk Management Insurance". Domestic scholars. Ma Ying and Xie Kefan(2007) analyzed transferring ways and means of marketing channel risk chain, and furthermore used the Markovian model to make a quantitative study on the transfer. Zhang Jianwen (2007),based on the analysis of marketing channel risk types, put forward the Specific methods and steps of channel risk control. Wu Yane (2007) analyzed the types and origins of marketing channel risk, and put forward the marketing channel risk evaluation model based on Fuzzy Synthetic method. Li Zhengquan (2002) analyzed the origins of cost risk and early warning characteristics of every channel's self-supporting cost, and discussed how to establish early warning and prevention system of self-supporting channel cost risk. Rui Xinguo (2002), from the perspective of cost risk control, presented a channel cost review system and a channel cost early warning system to select outsourcing channel. Li Wei(2001) classified the marketing channel security and put forward early warning index of the corresponding marketing channel security. Hou Zhongyi (2004) applied the theory of crisis management to classify the crisis of the marketing channel, and put forward early warning model of marketing crisis , established a crisis early warning model of marketing channel in theory. Lv Shuchun analyzed channel design risk from the channel level and price aspect, and did researches on distributor management risk from the perspective of partners' selection. Wang Ziguang (2005),based on the particularity of the Chinese market, put forward the importance of straightening out the relationship between manufacturers and agents to prevent and dissolve the channel risk. Yao Junwen (2006) ,applying the theory of crisis management and early warning management, constructed the basic structure of early-warning management system of the marketing channel , established alarming index system of marketing channel risk, and put forward the measures of marketing crisis management. Zhang Shuyun(2005)put forward corresponding management mechanism to prevent and control credit-sale risk ,strengthening the management of receivable accounts. In order to adjust to the flexibility of marketing channel and improve the efficiency, Peng Xianqi(2005) established risk priority degree

evaluation model to adjust the sales channel flexibly for the enterprise and enhance the efficiency of sales channel. Chen Jiabing(2002) argued referred that the chosen distribution channel could not perform well or meet the objectives and then caused a series of adverse consequences, which was the distribution channel risk; the distribution channel risk included distributor risk, storing-transportation risk and payment risk; at the same time he studied their causes and control measures .Sun Lili (2008) did research on the marketing channel risk types and causes, and put forward measures to prevent marketing channel risk .The above researches undoubtedly provide beneficial guide and reference for this paper.

## 2 The Analysis of Marketing Channel Risk Conduction Mechanism

Referring to the description for the enterprise marketing risk by dr. Dai shengli <sup>[1]</sup>, we consider that the marketing channel risk conduction is the process that in the business marketing channel system, because of inevitable interference and effects of uncertain factors, some small deviation or uncertainty from one point in the initial moments are attached to all kinds of transmission carrier, being sent and spread in various forms to every point and surface in the enterprise marketing channel , which results in the deviation or failure of the goal of the enterprise marketing channel .

According to the above definition, marketing channel risk conduction mechanism could be depicted as: risk factors from risk source, carried by risk conduction carrier, directionally move along the risk chain to risk conduction receptor, and thus triggering risk events, which eventually lead to the deviation of the performance and expected goal of marketing channel. As is shown in figure 1 below.

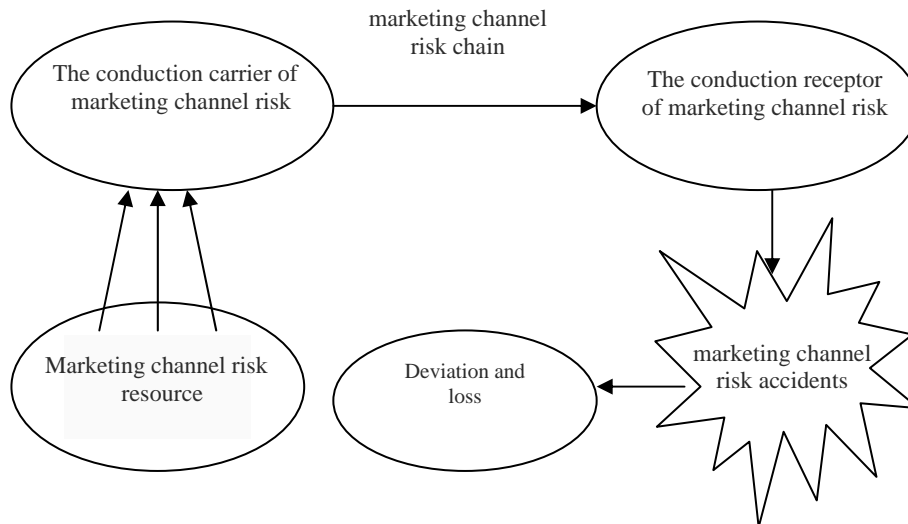


Figure 1 Marketing Channel Risk Conduction Mechanism

### 2.1 Marketing channel risk resource and risk factors

Marketing channel risk source is the collection of the unexpected changes and uncertainty factors in the marketing channel system, and also the origins to the deviation of goals and performance of marketing channel. It is the risk source that changes the equilibrium of internal and external environment in marketing channel, triggering the risk events, which eventually lead to the deviation of goals and performance of marketing channel. Marketing channel risk factors are the uncertainty elements affecting the marketing channel performance. They are the relationship of specific factors and the whole collection. Marketing channel risk source includes various marketing channel risk factors, and all kinds of marketing channel risk factors constitute a marketing channel risk source .

Generally speaking, the marketing channel risk factors can be divided into two categories. One is the uncertain factors which are hidden in the external environment of marketing channel system, including the adjustment of national policy and law, the change of the natural environment, the application of science and technology innovation achievements, the change of consumer demand, marketing strategy adjustment of competitors, etc. The other is derived from unsafe acts factors of behavior subject in marketing channel system, including the self-interest and opportunism behavior orientation of channel members , the anticipated conflicts resulted from the different division of labor among channel members, risk aversion strategy among channel members ,etc .

## 2.2 Marketing channel risk conduction carriers

Marketing channel risk conduction carrier is the bearing or form of the channel risk factors in the marketing channel transmission, including visible matters and intangible effects. In the process of marketing channel risk conduction, channel risk factors attach to conduction carrier, and being transferred or spread to a series of nodes and process in marketing channel system under specified conditions, mainly include product flow, capital flow and information flow, etc. Marketing channel acts as the shift channel of products' value. The risk conduction carrier is hidden in these processes, specifically including the following aspects:

First, product carrier. In the marketing channel system, product is the most common carrier of risk. For example: the discordance of understanding to the products' function between manufacturer and consumers; a mismatch between different stages of manufacturers' product life cycle and the corresponding marketing channel strategy adjustment; the loss of Products in the process of the transfer in the channel system and the different understanding of brand value caused by cross-cultural conflicts.

Second, capital carrier. There are various analytical factors in the process of capital operation of marketing channel. For example: in order to encourage downstream enterprise to purchase more, reducing the fund occupied and financing difficulties, upstream enterprises often adopt credit sales or set up a transaction mode with some credit limit; Under the pressure of downstream enterprises, upstream enterprises adopt the transaction mode of cash on delivery.

Third, information carrier. In the marketing channel system, because of the information asymmetry between the downstream enterprises and upstream enterprises, and the pursuit of benefit maximization for itself, the demand information in the marketing channel transmission is distorted; the channel members' perversion to demand information in the channel system is gradually amplified, forming "the bullwhip effect", and so on. The risk factors brought by information carriers not only make every link of channel invalidly run, but also bring cumulative effect.

## 2.3 The marketing channel risk chain

The marketing channel risk chain is the route through which the risk factors released by channel risk sources deliver to the conduction receptor of marketing channel risk. The marketing channel risk chain goes with all kinds of dynamic processes in the marketing channel system. Suppliers, manufacturers, brokers, secondary providers and consumers are likely to deliver the risk to the next member enterprise of the channel system through the marketing channel risk chain. It mainly includes the following forms<sup>[2]</sup>:

First, organization transmission. Due to the cooperative relations existing among the upstream and downstream channel members, the marketing channel risk can transmit through channel member companies. For example, the financial crisis of brokers will affect manufacturers' reflow of corporate sales income, and in turn, the manufacturers' financial difficulties will influence the suppliers' sales and production.

Second, artificial transmission. Under the guidance of the egoism, channel members may shift the risk to the other members in the channel, consciously and selectively. For example, large chain retailers may take advantage of their huge sales ability to make rules of the game, shift risk to suppliers by using the terms of the contract, even if there is something outside the terms of the contract, they can still force suppliers to accept.

Third, regime transmission. The formation and transmission of marketing channel risk is closely related to the regimes such as price system, sales policies, and marketing support, and so on. That out-zone sale, bad debts, and chaotic distribution area in the channel, are largely incurred by the imperfection of the system.

## 2.4 The conduction receptor of marketing channel risk

The conduction receptor of marketing channel risk is the subject receiving the channel risk, it receives the conduction of the channel risk, and also is the object of conduction. The conduction receptors' ability of acceptance and conduction for the channel risk is affected by many factors, including the perfect degree of the marketing channel functions, the correlation degree among the member companies of marketing channel system, and the reasonable degree of business process among the member of channel enterprises, etc. If the marketing channel has the correspondingly perfect functions, the design of business process among the member of channel enterprises and correlation degree between other channel members become more reasonable, the conduction receptor of the marketing channel risk will then have a stronger capability of resilience and digestion to the channel risk, thus reducing the conduction efforts of marketing channel risk.

## 2.5 The marketing channel risk accidents



The marketing channel risk accidents are the destructive events which caused by the risk factors of marketing channel. It's an actualization of the potential danger in the channel. As a result, there is a deviation between the expected goal and the actual result of marketing channel. What's more, the enterprises in the channel system will suffer loss from this.

### **3 The Management Mechanism Based on The Risk Conduction of Marketing Channel**

Because of the characteristics of the complex conductivity and the progressive bullwhip effect of the marketing channel risk ,once there is a comparatively large risk occurring among members within the channel system ,it will definitely bring relevant influence and loss to other members among channel enterprises. Therefore, it's necessary for channel enterprises to establish the management mechanism on channel risk conduction, aiming at the mechanism on channel risk conduction, to lessen the channel risk to a certain degree that the enterprises can accept, thus minimizing the loss of channel risk, ensuring the channel performance goal of enterprise coming true.

#### **3.1 The block mechanism on marketing channel risk conduction**

The risk factors released from risk source of marketing channel at the initial stage are usually just on one or some function node of the marketing channel .With the business dealings among members in the channel enterprises, the risk factors continuously conduct and spread to the relevant function node enterprises, forming the channel risk event consequently. It is that the block mechanism on marketing channel conduction is to block the risk conduction path through controlling the risk source by controlling the risk resource ,helping enterprises to avoid the uncertain result caused by risks .For example ,abandon channel business containing risks ;block the business contact with channel enterprises with poor credit ;reject credit sale under any conditions ;eliminate the dependence on potentially risky channel members ,etc.

The basic foundation of block mechanism on marketing channel risk conduction includes:

First, rapid channel message transmission network and valid channel risk monitoring system, which are to identify channel risk source and risk factors, analyzing the situation of channel risk conduction, supporting the decision of channel risk block.

Second, business capacity and history credit grading system of channel members, which grants different privileges and lines of credit to the channel members at different levels.

Third, channel accountability system, which is to find channel bottleneck timely, making up the short-board of channel.

Fourth, multichannel candidate system, which is to disperse channel risk effectively, avoiding the market vacuum after some channel quits.

Though the block mechanism on marketing channel risk conduction can help enterprises to avoid potential loss or uncertainties through blocking risk conduction, it simultaneously misses the opportunity to achieve potential benefit from the risk, and also coming to undertake all sorts of cost and responsibility from blocking risk conduction .Therefore, when we deal with channel risk by the way of blocking the marketing channel risk, some aspects as follows have to be taken into account:

First, whether the channel risk is one that is independent to enterprises' will and can't be controlled by the enterprises .The block to this channel risk will only waste enterprise resource.

Second, whether the block is reasonable in the economic sense from the perspective of cost-benefit. The loss may outweigh the gain if we chosen the way of blocking the channel risk conduction blindly, when the actual cost and opportunity loss caused by the channel risk block is higher than the profit achieved by undertaking the channel risk.

Third, whether the block to some channel risk may cause new channel risk. For instance, we adopt check clearance in order to avoid credit risks of authorized collection, but if this causes new risk of an empty promise.

Based on the consideration of the aspects above, the block mechanism on marketing channel risk conduction is appropriate for such situations:

First, risk with high probability of occurrence or which will trigger serious consequences.

Second, the cost to block channel risk conduction surpasses the revenue achieved by undertaking the channel risk.

Third, the probability of new channel risk caused by the block to some channel risk conduction is comparatively low or the new risk is under control.

#### **3.2 The channelizing mechanism on marketing channel risk conduction**

During the conduction process of risk factors released by channel risk source, the channelizing mechanism on marketing channel risk conduction consciously guides the direction of channel risk conduction and decreases the conduction speed ,reducing the possible loss and uncertainties which will be encountered by the enterprises .It is an alternative choice to effectively manage the channel risk conduction under the condition that the function of the block mechanism is limited.

The channelizing mechanism on marketing channel risk conduction includes:

First, guiding the direction of channel risk conduction ,that is, the enterprise initiatively guides the channel risk factors transferring to other risk-takers, shifting the possible risk and uncertainties to others .The main modes contain insurance transfer and non-insurance transfer .Insurance transfer is that the enterprise signs a channel business insurance contract with an insurance company ,paying a premium to exchange for the commitment of compensation for economic loss when there is specified risk event ,the purpose is to narrow the range of loss which some channel risk will bring to the enterprise .Non-insurance transfer is that the enterprise transfers the responsibility of channel risk loss to the risk-takers who are non-insurance institutions by exculpatory contract ,in order to exempt the risk-taker's responsibility for the loss.

Second, reducing the speed of channel risk conduction, that is, the enterprise delays the speed of channel risk factors conducting and diffusing among channel function-correlated node enterprises to the uttermost, thus postponing the time of channel risk loss realized. From the strategic perspective, the key to reduce speed of channel risk conduction is to establish flexible channel management system to improve the ability of defending risk of channel function-correlated node enterprises .The flexible channel management system emphasizes that enterprise change the single channel mode ,keeping the sensitivity to channel environment ,distinguishing the potential channel risk factors correctly ,utilizing and creating changes by continuously learn innovation ,developing flexible decision plan to cope with channel risk and take advantage of the channel risk ,thus increasing the resistance of channel risk conduction ,alleviating the intensity of driving force of channel risk.

### **3.3 Loss control mechanism on marketing channel risk conduction**

From the perspective of marketing channel conduction receptor, it can help channel risk receptor to lower the probability of channel risk loss and narrow the range of channel risk loss by establishing an effective loss control mechanism on channel risk conduction for those channel risks that are unavoidable or anticipated to acquire risk premium. The essence of this mechanism is to consciously improve the characters of risk conduction factors, being accepted by the channel risk conduction receptor, making the enterprises to achieve opportunities and rewards.

The loss control mechanism on marketing channel risk conduction includes:

First, The loss prevention on marketing risk conduction is the motivation and requirement for acceptors to control the conduction of channel risk factors, which will decrease the probability of loss caused by channel risk events .The loss prevention on channel risk conduction is established on the basis of recognizing the types and conduction characters of risk factors .With a prevention in advance, it can reach the goal of controlling the probability of risk events happening. In practice , it has the function of loss prevention on channel risk conduction on monitoring the channel environment 、 follow-up surveying the credit line of close correlated members in the channel and setting corresponding credit line ,etc.

Second, The loss restrain on channel risk conduction is that the channel risk conduction receptor will prevent the magnification of event influence through the measure of emergency treatment ,thus narrowing the range of loss cause by channel risk events when acceptors faced with risk events. In practice , it has the function of loss restrain on channel risk conduction such as establishing the reserving alternative channel 、 giving warning penalty to channel that caused heavy loss to enterprises ,etc.

Something to point out :the focus of loss prevention on channel risk conduction is to reduce the probability of the loss caused by channel risk events ,nevertheless the focus of loss restrain on channel risk conduction is to narrow the range of loss caused by channel risk .Yet ,during the process of channel risk conduction management ,the two are often inter-infiltration ,each other is premise ,the combination of loss prevention and loss restrain jointly realizes the control to channel risk conduction loss .

## **4 Conclusion**

Under the complex and turbulent economic environment ,with more and more uncertainties, the marketing channel faces a series of risk puzzles which limits the increase of enterprises product salesman volume and profit .Hence ,establishing effective management mechanism on channel risk is of

prime importance for enterprises to avoid and rein risks and achieve risk premium .This paper mirrors the research achievements on marketing channel risk management from domestic and overseas scholars ,discussing the management mechanism on channel risk from the perspective of channel risk conduction , constructing the management mechanism on channel risk with risk conduction block ,risk conduction channelizing and risk conduction loss control as its core .And it still needs to dig deeper into the study of the dynamic process ,the measurement and the assessment of the channel risk conduction .

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## Innovation Mechanism of Academic Journals

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**Abstract:** The present article deals with the issue of the quality of academic journals. After we have analyzed the current situation of the problems, we propose some solutions. Academic journals should try to attract the best articles by making an arrangement in advance with the writer or by contributions solicitation. At the same time, the amount of subscription should be enlarged and the academic quality of the editorial team should be improved. It is also important for striving for more financial support. We conclude that the coordination of the different aspects involved is the key to the improvement of the quality of academic journals.

**Key word:** Academic journals; Management; Multiple linear regression model; Impact factor; Circulation

### 1 Introduction

It is commonly acknowledged that one of the problems with the academic world in China is that, in spite of the large quantity of the published articles, the quality is less than desirable. As a result, publication in international journals is taken as an important criterion in evaluating the research of scholars. The relatively higher prestige enjoyed by international journals can be attributed to undesirable quality and prestige of the domestic ones. Such a situation calls for innovation in the management systems in domestic journals, especially where the quality of the journals are concerned. In an article by the National General Administration of Press and Publication on *People's Daily* in Feb. 2<sup>nd</sup> in 2011, it was pointed out that some domestic academic journals should be evaluated and inspected in order to initiate some necessary changes in the academic field. Those journals that ignore the tenet and domain of the publication, show poor quality and management, and make money by the publication fee will receive administrative penalty. Some may even be forced to close down<sup>[1]</sup>. It is clear that to improve the quality is the lifeline and developing direction of the journals. The following are our ideas about the quality management and innovation of academic journals with respect to our practical experience.

### 2 Article Quality Management

#### 2.1 Obtaining articles by first-class writers

The common practice in running a journal is to wait in the office for the submissions to come and to choose from them. This is the usual and conservative way and it may not so effective in getting the best quality articles, which are of vital importance to the improvement of the quality of academic journals. There are three premises leading to high-quality articles. First, the personality of the editor is relevant. If the person who is contacting the writer is not easygoing and show strong officialdom, the expert may easily turn his/her back on the journal. Secondly and most importantly, the prestige of the academic journal counts a lot. Only when you have improved the quality of the academic journal, experts may be willing to contribute their research papers to your journal. This is a process of mutual promotion. Once relationship between the editorial department and the experts has been brought into a benign cycle, the prestige of the journal will soon be established. Finally, the editors are advised to communicate with the experts frequently, and to attach more importance to article resulting from nationally funded projects and major construction projects. And they should be ready to send the feedbacks of the experts' opinions to the editorial department. They should often consider how to organize more good articles in order to better serve the academia.

When the above three conditions are satisfied, the editorial department should make a scale of subject plan in the academic frontiers. They should choose leading issues or make specific plans about what to publish. They should make an arrangement with the authoritative writers or related scholars in advance, and make contributions solicitation with such writers with respect to development tendencies and research trends of the time. With this accurate positioning, they can determine their aim and may be able to communicate better with the writer, and then they can obtain the best articles, which may in turn improve the quality of the journal. In this way, the competitiveness of the journal will improve and it will occupy a more and more important position in the academia.

Furthermore, in the process of getting good quality articles, particular attention should be paid to the advantage of cultural environment which may give support to the journal. For instance, *Higher Education Research*, which is a high-quality journal in the higher-education circle, has been a strong component of the academic strengths of the Institute of Education Sciences of Huazhong University of Science and Technology. Similarly, *Journal of Rock and Mechanism Engineering* is also growing gradually under the academic support of the mechanism institute of CAS Wuhan Branch and finally becomes a high-quality journal.

### 2.2 Flexibility in designating the length of articles

It goes without saying that the number of pages within each issue is the limited resources of a journal. In order to maximize the benefits and publish as many articles as possible, the following methods are suggested for the editor to deal with articles: (1) try to save space to publish as many articles as possible, (2) shorten the article. According to She Shigang, the chief editor of *Journal of Rock and Mechanism Engineering*, the average length of articles is 5.5 pages in 2005, it is 7.8 pages in 2010. This means that both the average length and the quality are on the rise as prestige of journal improves. A typical article will put forward a question, which is usually followed by some analyses and a solution. As a result, it will include the sections of an introduction, a main body, and a conclusion. All these usually amount to 6000-7000 words (4 or 5 pages). Due to the characteristics of liberal arts journals, there is more descriptive language in articles. We should be flexible where the lengths of articles are concerned. Rigid length limit will do harm to the quality of articles.

## 3 Management Efficiency

### 3.1 Impact Factor

Impact factor refers to the total times of citation of articles published 2 years ago divided by the total research number. It is internationally used as an evaluation index of journals. However, the impact factor has its limitations. The quality and features of articles published, the features of journals, the subject differences, and the distribution and amount of the source journals library are the factors that reflect the impact factor. Generally speaking, the greater amount of the published articles, the more likely those articles are cited, and the larger amount of the impact factor<sup>[1]</sup>. It takes a relatively shorter period of time for shorter articles to be published, so the total citation frequency will increase.

Impact factor is influenced by the total number of journals from different subjects, average reference number, and the cited half-like (this refers to the total citation times during the whole year in the statistics of the journal, and how long half of the newer citation number comes to accumulation)<sup>[2]</sup>. Therefore, when we evaluate the quality of a journal, we should not merely consider the impact factor but also associate the citation number with other evaluation indexes. Moreover, some journals that lack academic integrity, because of the influence of the vicious competition, form illegal alliance and take some means to improve the impact factor. The relation between improving the impact factor and journal quality is like that between Chinese exam-oriented education and quality-oriented education. As Elman advocates, the more celebrated goals of running a journal is to develop its social influence. As we go through the official evaluation processes, we should keep in mind that the more worthwhile long-term goal is to improve its prestige by enhancing the quality of journals. The quality is to be evaluated by using examination and the aim of improving quality cannot be achieved when focusing on the exam-oriented education. Quality is the basis and the way to take exam is the auxiliary means to promote the short-term effects. If the editor tangles on the impact factor all the time, the result will be like the exam-oriented education. You may come to a dead end when you pay a lot and get far away from your original aim and cannot get back. Only by improving the article quality, by strictly regulating the editing process, and by increasing the influence of the journal can the quality of journal be substantially improved. If we improve the quality and the prestige of the journal step by step<sup>[3]</sup>, the impact factor will increase and many important writers will be attracted to your journal, as is the case with many prestigious journals.

The two major factors of influence are the quality of contributions and quality of editing. Of course, these two factors are weighted differently. I set the factor of influence at “a”, the high-quality contribution at “ $a_1$ ”, the quality of editing at “ $a_2$ ”, the coefficient of “ $a_1$ ” at “r”. The relationship among “a”, “ $a_1$ ” and “ $a_2$ ” can be represented as:

$$a = r \times a_1 + a_2$$

### 3.2 Circulation promotion

Most academic journals usually pay much attention to current trendy academic topics. They do not

have a clear idea of what they should aim at in the long run, without even paying enough attention to the size of the circulation. This is true with some prestigious journals such as *Historical Research*, *Social Science in China* (both are hosted by CAS), whose circulation is less than 8000 copies, let alone the local social ISS and the journals hosted by some colleges and universities, whose circulation is about 2000-3000 copies at best and 300-500 copies at worse. Some journals send free issues to the readers<sup>[4]</sup>. Academic journals have their unique characteristics; the amount of circulation represents the size of the readership, which in turn reflects its academic influence. Promoting circulation can not only bring about financial benefits but also improve the academic influence and promote journal quality. Except for the post office subscription, the editorial department should spare no effort to popularize their academic journal and expand the range of its audiences by holding some academic activities. They can form a mutually benefiting relationship with the readers to popularize the journal. The academic journals in the same field or of the same organizer can form a group in the market in circulation promotion. They can also manage the academic influence of the journal by setting up network data, in order to promote the circulation, so that a positive cycle can be formed yielding both academic and economic rewards.

### 3.3 Striving for financial support

Academic journals are usually hosted by the government or science institutes and colleges affiliated to some public institutions. The main source of finance is the administrative funding. The public investment is limited (less than RMB 10, 000 yuan a year). According to some insider's estimate, 30, 000 yuan are needed to ensure the normal operation of an academic journal. That is one of the reasons for the phenomenon of making money by the payout fee. It is a cultural enterprise to found and manage academic journals, and it needs the support of the government. The expenses of running a journal include among other things, paying the invited contributions, participating and hosting academic conferences, and the daily editing activities. The organizer should try different means to obtain more financial support in addition to the current financial resources. This is practically important in that it makes possible all the quality activities of academic journals.

## 4 Training Editors

Editing is an laborious and painstaking job, which demand a comprehensive range of practical skills including that of dealing with the literature and the references, charts and tales, etc. Those skills are essential to the quality of journals. We should encourage communication among colleagues to improve the editing quality within the profession.

The editing profession is a demanding and hard job. Capable editors should pay attention to the academic situation of the related journals. They should have a correct understanding of the theory and sensitive insights to excellent articles. They should be able to conduct editing process of the articles efficiently and accurately. Therefore, the quality of editors should be improved if we want to improve the journal.

## 5 Conclusion

It is a comprehensive process to improve the quality of academic journals. It means coordination and efforts from different parties including financial support from the government, obtaining high quality articles and strict observation of principles and standards in choosing and editing articles on the editors' parts. This can be formulated as follows:



Figure 1 Mechanism of Academic Journals

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# The Advantages of Brand Management Innovation in Product Competition

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**Abstract:** In this paper, the brand management innovation of the research methods, and put forward the internal driving force, the core value, cognitive pattern and integration promotion plan, construct a carefully designed the complete business system, the brand innovation of management of the core—brand and consumer contact-any point, line and plane can effective integration and control all communication level element, make its fully reflect the core value of the brand and strategy. For every may affect consumers to the brand experience, or to the brand of the activities and view the decision-making, must strict management control, it is concluded that the brand management innovation can be in today's fierce competitive products get huge advantage conclusion.

**Key words:** Brand management; Innovation; Superiority

## 1 Introduction

The word "brand" is not strange, many entrepreneurs and managers are often in a variety of business communication about the product brand, "brand" can be regarded as anthropology research results applied in modern social behavior model. "Experience" is through the brand communication, it has become the modern city life a kind of label. If we on this label is put to good use, can compete in the product obtained in the huge advantage.

## 2 Brand Management How to Innovation

### 2.1 What is the brand

Brand can often through the product attributes, packaging, name, price, history, credit, advertising and sales promotion behavior, concrete expression comes out, the definition of brand will often by consumer feel and experience and decide. Therefore, we also said the brand is leading, by consumers by enterprise to create and care, through the products and consumption to express a kind of complex and unique business relationship and symbols.

### 2.2 Brand management how to innovation

Brand management of innovation is the most important is to enhance brand management innovation the driving force. Because the brand is the symbol of the complex relationship between the products, consumers and businesses three. Brand driver elements include—brand management innovation and enterprise core consumer driving force driving force.

First, need to improve consumer driving force—Brand products to consumers decided to brand transformation

“Consumers have a brand” This view has been more and more recognition. The brand is the relationship between consumers and products, each behind the brand that contains at least one product. In the era of market purchase rate decision, the consumer in the end about what to buy? Consumer products and services to the understanding of the known, identity, in the ownership of the association, catalytic effect through cascade, under the progressive, realize the product to brand transformation.

Second, need to improve the enterprise core driving force—The driving force of enterprise core brand ultimate is the core competitiveness of the enterprise.

The product competition, the brand construction is not only required for survival of the enterprise, and promote the enterprise brand itself is high speed, high efficiency, and low risk and sustainable development of the force at the core. Core competence is the enterprise access, allocating resources, form and can stay competitive advantage of ability. Core competence is the foundation of the enterprise survival, but also the development of the enterprise core power.

### 2.3 Brand management innovation core value

Brand management innovation is the core value of the brand owners of core values reflect. Brand management innovation core value is not only the consumers of driving force driving force and enterprise core polymerization overlay, and it is both the generation after polymerization of new kinetic energy. The product brand management core value and brand owners have inseparable relationship of



dependence.

For example, bold and unconstrained, masculine, attractive “Marlboro” cigarettes, its consumer driving force elements have: bold, power, freedom, independence, rebel, and the enterprise core driving force is: enthusiasm, strong, independence, and freedom, and power. Visible, freedom and independence is the “Marlboro” brand core values. It is not only a man exclusive tobacco brand of psychological suggestion, and is “Marlboro” enterprise internal spirit and values reflect. Thus, only the abstract core value of refined into the core concept, we can clear brand personality style, theme design and induction, which is undoubtedly the core of the brand management.

**2.4 The core content of the brand management innovation**——Brand personality let the core value of the brand humanization

The brand is the efforts of a business for unique consumer groups. Brand management innovation of the fundamental essence is in the communication and interaction. Consumers have already used to evaluate a company personality factors or brand. When enterprise for their own brand created a character, the brand is more easily impress consumers. Give the consumer brand personality of the different cognitive feeling and different levels of experience, the core value of the brand specific, personal, and also promoted the development of the brand. Marlboro cigarettes are a product quality and perceptual characteristics link into simple, powerful character brand, at the same time will brand elements together of the typical case.

In order to achieve better communication, Marlboro the brand is personified. “Morris” company through the choice, Marlboro symbol of “cowboy” to achieve this purpose communication. So, Marlboro is setting up its image: freedom, haggard and adventure. This image is like a bridge, it connects the Marlboro cigarettes and Marlboro individual character. One of the most important is the Marlboro individual character. Marlboro cigarette smokers have attracted to such attraction, in the final analysis because of its brand personality.

### **3 The Advantages of Brand Management Innovation in Product Competition**

#### **3.1 Advantage category**

##### **3.1.1 Brand style are more likely to be felt—Multidimensional information dissemination**

The brand is the product and the relationship between consumer and enterprise, and information is dependent on the spread in the relationship. Can say consumers of brand of cognitive is according to what he can sense a comprehensive information and gain. Therefore, the spread of information to cognitive model of brand multidimensional nature of multidimensionality, this makes the brand product competition in more easily be the feel of the consumers.

##### **3.1.2 Brand recognition is easier to be identity—With the core value of the brand and brand positioning as the center**

As for brand recognition, consumers first through the enterprise or product external form to perceive the enterprise or the existence of the product brand, thus gradually to accept and agree with them. And the enterprise must be a strategy for the foundation, on the brand construction, we should pay attention to the core value of the brand and brand positioning as the center, can be the feel of the consumers through all kinds of the brand information, form strong brand recognition identity.

##### **3.1.3 The brand image is better convey—From “eye” to “heart” visual communication process**

Visual communication design to the innovation of the brand construction can make the brand image of better communicated:

First, the visual communication design to create value a. graphic design can reflect the product function b. spread to be able to be reflected message form

Second, Visual generates loyalty. Visual identity is actually emotional identification, emotional make enterprise products and consumers have linked, make consumers of enterprise and brand loyalty products produced.

Third, visual communication design can improve the added value of products. Aesthetic way of a consumer to whom the feelings of identity resides in the product, they increase the product value-added.

Fourth, the visual communication design can dash forward show the product's personality. Special product personality can not only attract the attention of consumer, also can be accepted by consumers. Through the design to let the product a perfect expression of, will be deeply impress the consumer heart, and have an emotional connection with consumers.

Fifth, visual communication design will make brand always lead, design competition not imitate brand have feeling elements.

In the 1930s, the “Marlboro” together with other consumer goods, had because of the economic crisis brings “the depression years”, when it’s name little-known. Embrace be unwilling mood, “Morris” company began to consider remodeling image.

MARLBORO to the core value of the brand and brand positioning as the center, the product quality unchanged, the package was the first of the open the lid technology flat, and the name of the standard word (MARLBORO) sharp edges, which make it more rich men are strong, and the main color of red as a result.

In addition, the company sends someone to please the Leo Burnett advertising agency for advertising planning “Marlboro”, played the fame of “Marlboro” sales. Only 1954-1955, the “Marlboro” sales increased three times, became the nation’s 10th largest cigarette brands, 1968 and its market share rose to second in the nation counterparts. Now, “Marlboro” in the world, “Marlboro” every year in the world with 300 billion cigarettes, 5000 Boeing 707 aircraft can be finished loading. The world every removed 4 cigarette, including one is “Marlboro”.

What is it that makes the little-known “Marlboro” become so a favor? Survey shows that: the real fascinating is not the “Marlboro” and other between the taste of cigarettes small differences, but “Marlboro” advertising, information and packaging to cigarette brought about by the sense of superiority. This set of multi-dimensional information transmission, to the core value of the brand and brand positioning as the center, from “eye” to “heart” visual communication way makes “Marlboro” brand in the competition to make a great advantage.

### **3.2 Advantage penetration**

The innovation of the brand management is how to realize the advantage in the market competition of penetration? We will this advantage through the brands of legend, public relations, advertising, marketing, sales promotion, direct effect Internet marketing all aspects of the permeability reflected.

Brand legend: how to make the brand has focus effect? The public psychology proof: the legendary brand, the more we can cause the public attention. The name of the Marlboro, from their first cigarette factory address in London, its founder Philip Morris thought of company in London factory on a street name “Marlborough”. Another and there another kind Of statement, the brand name from “Man Always Remember Love Because Of Romance Only is the abbreviation Of”, namely “the Man Because Remember romantic Love”, and the corresponding have compiled for the lovers story. The origin of these brands, the founder of the unique experience, and the consumer’s brand evolution personalized consumer experience can inspire more interested in the market, and to the spread of the brand to stoke the.

Advertising: the midst of brand promotion homework, standing in the position of the consumers, from their starting their feeling, or the point of view of products for the consumer to solve the problem of the immediate, with different impression and psychological pleasant advertising impress consumers.

Public relations: affinity, brand orderly appearance, the establishment of affinity between brands and consumers, an orderly relationship.

Straight effect marketing: let the brand and target consumers for deep communication, construction target consumers, human services, maintain contact for a long time.

Promotion: consumers buy action to shareholders, innovative promotion form and content to meet and meet the core value of the brand, positioning and individual character style, etc.

The success of the Marlboro cigarette filter except benefit from mouth, unique, have also benefited from the outer packing in advertising, public relations, marketing policy efforts. In order to make the advertisement effect lifelike, in Marlboro cigarette advertising, the poster people present, is to find the real American cowboy, and nonprofessional model. For freedom, straightforward men and listening to the cowboy to impressive background music with very successful, AD copy Where there is a man, there is a Marlboro (Where there is man, Where to have Marlboro), the more memorable. In the world of advertising marketing strategy implement consistency, and established the Marlboro cigarettes in various countries consumers idea of the unity, integrity, the image of the deep foundation, and Philip Morris companies also, thus creating the largest advertising effects and marketing benefits. The success of the marketing strategy has made Marlboro cigarettes popularized worldwide.

## **4 Conclusion**

Through the analysis of the brand management innovation, we can see that the brand management innovation in product competitive advantage is huge. Consumers usually in particular style of brand perception in understanding the brand information, set up the brand personality, and the enterprise is

based on consumer consumption experience and market dynamics, the initiative to convey the theme with brand information, deepen the impression of consumer brand and good will.

And innovative brand management clear the brand of consumption and enterprise core driving force driving force, this is sketching brand vision, realize the value of the largest commercial brand foundation. At the same time, it effective integration the driving force of the brand, combined with the brand owners and operators of the core values, induces the brand vision. It makes the product has strong ability to adapt to the change of control the core brand, and in the variety of the market always make sure that the competitive advantage of. In addition, it also let the consumer brand cognitive more objective, realistic and plump, make enterprise inside and outside each link resources and power more integration, to ensure that its full compliance with the core value of the brand. I believe in the near future, brand management innovation will become the most competitive products of the advantages of the brand management framework.

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# Knowledge Management Based on the Cultural Historical Activity Theory

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**Abstract:** This paper presents various perceptions on the knowledge management, and analyses the complex interaction between technology and people in the knowledge-making. Moreover, the paper uses the Cultural Historical Activity Theory (CHAT) as the theoretical framework to study the knowledge management and to design the knowledge management systems. In addition, studies on the Chinese universities demonstrate the importance of adopting a holistic approach, including cultural, historical, contextual and dynamic, to knowledge management.

**Key words:** Knowledge management; Knowledge management systems; Organizational knowledge; Cultural historical activity theory

## 1 Introduction

As the information and communication technologies advances, the organizational interest in knowledge as a critical strategic<sup>[1]</sup> resource and organizations are looking to information technologies for solutions to knowledge management (KM) efforts. The computer-based information systems (CBIS) are becoming sophisticated and complex. However, there remains incongruence between their prescriptive requirements and the intangible and volatile nature of knowledge. The need for structure in CBIS, has meant that most computer-based knowledge management systems (KMS) attempt either to measure and codify knowledge, including intangibles such as intellectual capital, intellectual property and intellectual potential, or to enable the sharing of knowledge, which essentially resides in people. Currently, most technologists lack the understanding of the situated work practices of user communities, making the low success rates for KM type systems. Systems designers do not have accepted models for the large invisible and complex nature of work that KMS are expected to support. Whether the KMS are effective, it depends as much on the social context of users, their perceptions of their roles and community expectations, as the design and functionality of the system.

With the advent and rapid development of knowledge economy, great changes have taken place in the environment faced up with by the colleges and universities, which puts forward unprecedented challenges to the colleges and universities. Universities invent and pioneer, networks and knowledge management with, and without, new technologies. Therefore, universities represent an ideal setting for an examination of the complex interaction between technology and people in knowledge making and KM. This paper begins with a presentation and discussion of various perceptions of organizational knowledge and what KMS are, or should be, with the suggestion that the Cultural Historical Activity Theory (CHAT) be used as the theoretical framework for both the study of KM and the design of KMS. It will then describe a study in one Chinese university. The study uses the CHAT approach to improve the university's existing KMS. A significant outcome of the study was recognition of the importance of adopting a holistic approach to KM, which is cultural, historical, contextual and dynamic.

## 2 Connotation of KM

The KM, emerged in the 1990s, has not formed a standard definition up till now.

By synthesizing various opinions of the schools, the connotation of KM would be drawn. KM is a process for members of the organization to develop, manage and use the internal and external knowledge in order to promote the acquisition, communication, sharing, and innovation of the knowledge by using technical means in certain circumstances. It is the management theory and method for the organization to enhance the creative ability and core competitiveness.

KM involves knowledge, people, environment, culture and organizational structure, etc... From the Angle of Business Process and with system, comprehensive view, KM contains not only the tasks concerning KM, such as the classification, coding, innovation, share, application and appraisal of the knowledge, especially, but also the factors effecting KM, such as organization's strategy, KM strategy, organization culture, personnel participating in KM and organization learning.

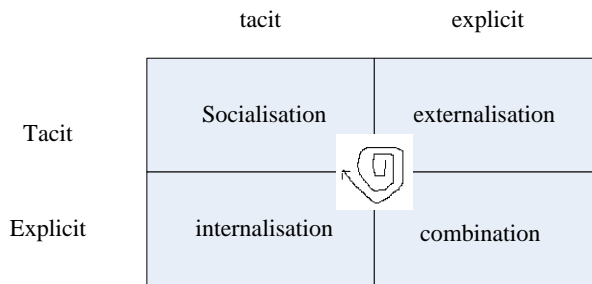
### 3 Knowledge in Organization

The widely-used concepts of organizational knowledge<sup>[2]</sup>, knowledge work<sup>[3]</sup>, organizational memory<sup>[4]</sup> and the learning organization<sup>[5]</sup> imply that knowledge processes in organizations are complex, distributed, context dependent and dynamic<sup>[6]</sup>. Each of these attributes will now be discussed.

The complexity is evident from the tensions between the old and the new, between the desire for change and the need for stability, between ambiguity and clarity in sense-making<sup>[7]</sup>, between improvisation and ordered decision making, between diversity and consensus, between the different natures of tacit and explicit knowledge<sup>[8]</sup>, and between the push for competitiveness in business and the need to cooperate for knowledge sharing. There are constant conflicts between individual, group and organizational goals between intentional information seeking and scanning for general sense-making<sup>[9]</sup>; between rational computer-based system requirements and the nebulous nature of knowledge in people. Knowledge management could be thought of as the quest for achieving a balance between the extremes on each of these dimensions.

In order to understanding how knowledge is distributed it is useful to draw on the concept of distributing cognition across the human and technological members of a critical team situation<sup>[10]</sup>. A major shift, associated with the advent of information and communication technology (ITC), is a shift from individual notions of expertise and merit to shared information, knowledge and teamwork, i.e. from individualism to collectivism<sup>[5]</sup>. Organizational knowledge creation occurs when people combine and exchange their personal knowledge with others and there is little doubt that organizations that will excel in years to come, will be those that understand how to gain the commitment of employees at all levels and continually expand their capacity to learn, supported by ICT systems<sup>[11]</sup>.

The question of context arises in the debate between the view of knowledge as object, extracted from its context, and knowledge in its context, embedded in individuals. McLure-Wasko and Faraj<sup>[1]</sup> identify a third perspective, that of knowledge embedded in the community, perceived as a public good that is socially generated through actions and interactions, maintained and exchanged within communities of practice<sup>[12]</sup>. The view of knowledge embedded in community activity implies that organizations are best conceptualized as a collection of overlapping communities of practice. Employees do not receive, or even construct, abstract, objective individual knowledge rather they learn to function in a community. Knowledge, in this view, supersedes any one individual and the knowledge capital of the organization can be considerably more than the sum of the individual knowledge of employees. This is the sense of the metaphorical concepts of organizational memory, while the creation of new collective knowledge is reflected in the term the learning organization, where the collective context of knowledge is retained.



**Figure 1 The Knowledge Creation Spiral of Nonaka**

The dynamic process of KM is described in the model of Nonaka<sup>[6]</sup> in which explicit and tacit knowledge in organizations are exchanged and transformed through four modes (Figure 1). Socialization is the process whereby tacit knowledge is transferred from one individual to another. Combination allows the existing explicit knowledge to be integrated into new explicit forms. Externalization is the process of converting tacit knowledge into explicit knowledge in the form of concepts and models. Internalization allows individuals to absorb explicit knowledge and broaden their tacit knowledge so that new knowledge could be developed. This has led to the knowledge creation spiral of Nonaka and Takeuchi<sup>[8]</sup>, shown in Figure 1, which views organizational knowledge creation as a process involving a continual interplay between the explicit and tacit forms of knowledge, through the four transforming modes, and evolving from the individual level, through the group level, to that of the organization as a whole.

## 4 Approaches to KMS

The two most common forms of KMS are based on perceptions of knowledge as object and on knowledge as embedded in people. Typical of the first approach is the notion that KMS are information systems designed specifically to facilitate the sharing and integration of knowledge<sup>[13]</sup>. The second form of KMS is typified by a statement such as "the goal for KMS is to create a connected environment for knowledge exchange, a technical embodiment of corporate memory"<sup>[14]</sup>.

KMS based on the first perspective, of knowledge as object, are referred to as product-centered, content-centered or codification. Here knowledge is an entity separate from its context and from the people who create and use it. This is consistent with the view of Alavi and Leidner<sup>[13]</sup> that KMS are special purpose information systems. In the process- or people-centered KM perspective knowledge is closely tied to the person who developed it and is shared through person-to-person contacts. The main purpose of information technology (IT) in this approach is to help people communicate knowledge, not to store it. Thus, organizational knowledge is the sum of knowledge in the minds of employees and organizational knowledge increases through the learning of individuals or adding new people to the organization. In this view knowledge is difficult to codify and loses its value once coded. A KMS becomes a communication device to link experts with knowledge seekers<sup>[1]</sup>.

While these two divergent approaches each have merit in giving an organization a clear direction to follow, they avoid many of the difficult and critical issues that are picked up in the following three definitions of KM:

(1) KM caters to the critical issues of organizational adaptation, survival, and competence in face of increasingly discontinuous environmental change. Essentially embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies and the creative and innovative capacity of human beings.

(2) An operational objective of KM is to ensure that the right knowledge is available to the right processor in the right representation at the right time for performing their knowledge activities at the right cost<sup>[15]</sup>.

(3) In addition there is the popular Nonaka<sup>[6]</sup> and Takeuchi<sup>[8]</sup> concept of the knowledge spiral where the creation of knowledge is built on the interchange between tacit and explicit forms of knowledge enacted through the sequential process of socialization, externalization, combination and internalization. These descriptions indicate that KM problems should be tackled from a holistic view that balances the roles of people and technology, the individual and the organization and place KM in a cultural and historical context. McLure-Wasko and Faraj<sup>[1]</sup> identify a third perspective underlying the design of KMS in addition to those of knowledge as object and knowledge embedded in people. This is knowledge embedded in the community, perceived as a public good that is socially generated through actions and interactions, maintained and exchanged within communities of practice. The view of knowledge embedded in community activity implies that organizations are best conceptualized as a collection of overlapping communities of practice. Learners do not receive, or even construct, abstract, objective individual knowledge rather they learn to function in a community. Knowledge supersedes any one individual, is highly context dependent and is embedded within a community KMS in this view are utilized to enable discussion, mutual engagement and exchange between members of the communities of practice. This could include elements from the previous perspectives where CBIS capture and store knowledge objects used by the community together with facilities for communication. However the KMS also need to support a dynamic process of interchange where knowledge is constantly being regenerated and recontextualised, thus maintaining its relevance to the community. Judge et al<sup>[16]</sup> observe that work units behaving as focused communities are more innovative.

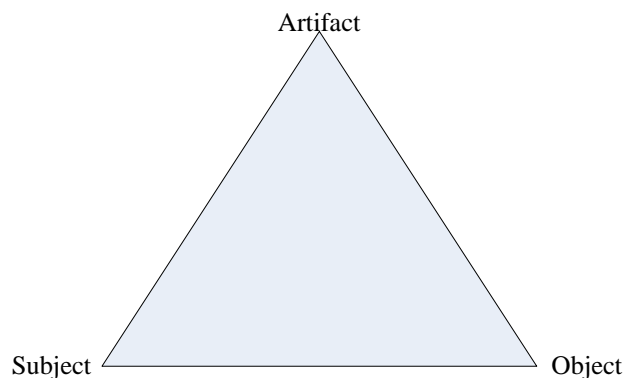
Researchers are actively seeking methodologies, frameworks and theories to enable a way forward in this complex area. Schultze and Boland<sup>[17]</sup> use Structuration and Actor Network theories to focus on action and agency in understanding how IT, organizations and practices shape each other. Mentzas et al<sup>[14]</sup> have developed a holistic conceptual framework, a KM methodology and an intranet-based tool with an emphasis on technology, cultural, organizational and managerial issues. The Cultural Historical Activity Theory will now be presented as a more relevant basis of an effective framework both for the study of KM and for the design of KMS.

## 5 Cultural Historical Activity Theory

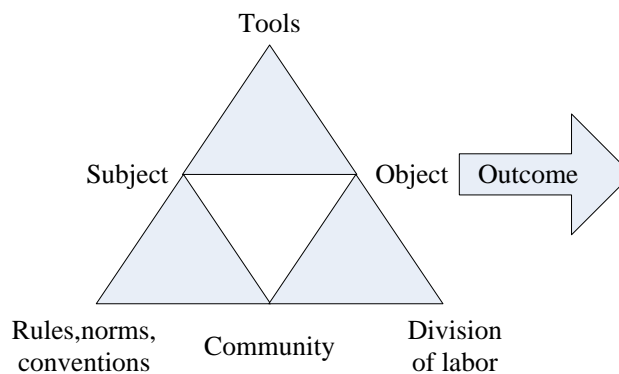
CHAT represents one of a broad family of theories that view the cultural mediation of behavior to be the central moment in the constitution of the human mind (Engstrom, Miettinen, &

Punamaki<sup>[18]</sup>.1999). It is rooted in the Russian psychological tradition initiated by the developmental psychologist Vygotsky, together with his colleagues Luria and Leontiev (Leontiev<sup>[19]</sup>. 1978; Luria<sup>[20]</sup>. 1971; Vygotsky<sup>[21]</sup>. 1978). CHAT is an interdisciplinary enterprise, as it emphasizes the role of culture and society in organizing the proximal settings in which individual change is studied. It brings together a wide range of scholarship, including the ideas of philosopher and psychologist John Dewey, sociologist and psychologist George Herbert Mead, literary & cultural theorist M.M. Bakhtin, Marxist philosopher E.V. Ilyenkov, philosopher and literary critic Kenneth Burke, and anthropologists including Gregory Bateson and Clifford Geertz. CHAT emphasizes the primacy of social processes in human development, the importance of semiotic mediation in this development, and a view of this development as simultaneously occurring in phylogenetic, ontogenetic, cultural-historical, and micro-genetic time. In this paper we focus on the ontogenetic and micro-genetic time scales

The basic structure of human thought that emerges from sign mediation has typically been represented using a triangle (see Fig.2 where the base signifies the ‘direct’ relation between individual and environment and the path via the vertex stands for the ‘indirect’ route of artifact mediation<sup>[22]</sup>. These relations exist simultaneously, creating a qualitatively distinct structure to human action that Vygotsky<sup>[23]</sup> (1929) referred to as the ‘cultural habit of behavior’. Vygotsky’s colleague, Leontiev, concerned that Vygotsky’s view was too narrowly focused on the individual, despite his emphasis on the social origins of individual psychological functioning, suggested that the historically evolving division of labor brought about the crucial differentiation between individual action and collective activity (Engestrom<sup>[24]</sup>. 1987). Leontiev therefore proposed that in thinking about the mediated nature of human thought we must theorize not only the relations among individuals, their objectives, and the mediational means they employ, but extend this theorizing to include the interconnections among these units and the larger social structures which play a part in organizing the unfolding of the actions being studied. Engestrom<sup>[24]</sup> (1987) subsequently represented this unit of collective activity by expanding the semiotic triangle to include broader mediating social structures (see Fig. 3).



**Figure 2 The Basic Meditational Triangle**



**Figure 3 Cultural Historical Activity Theory Model**

The significant difference that CHAT brings to the study of KM is that it places the focus of study on the activities that are carried out by people in support of their interpretations of their role, the

opportunities available, and the purpose for which the organization exists.

Central to CHAT is the concept of the way all human activities are mediated by the available tools. Figure 4 indicates the kinds of relationships that are recognized in CHAT between human activity and mediating tools. Knowledge and KMS are complex tools that mediate the activities of organizations and are themselves influenced by the particular circumstances of the organization. Activities, and the tools used, must therefore be studied together in the context of the organization where, and at the time when, they occur. This implies a new interpretation of knowledge in organisations which was once conceived as something that only existed within people's heads. Knowledge management systems are tools that now actively mediate aspects of knowing and activity. In particular, KMS potentially provide a new kind of extracranial 'operation' that can be used by people in their activity to extend their capabilities in complex settings.

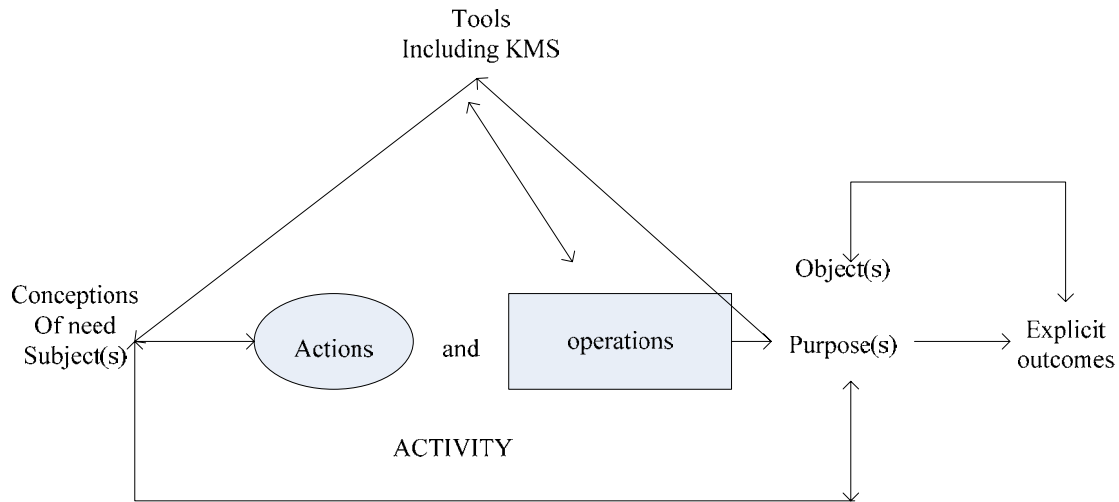
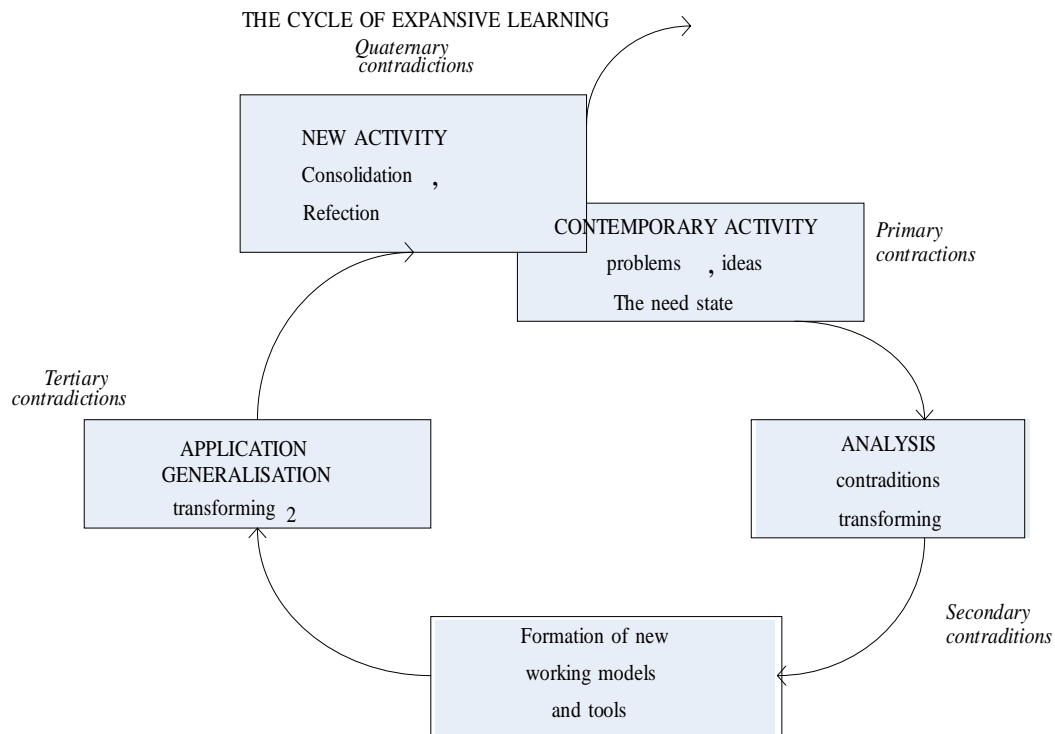


Figure 4 The CHAT View of Activity

Because of the nature of information technology, KMS have initially been tools to automate and standardise the skilled, and often idiosyncratic, processes used by people to classify, store and provide managed access to complex organizational information. The impact on people has often been a sense of deskilling. The early systems have often usurped an operational role in human activity. The more recent convergence of communications and information technology has again changed to possibilities for knowledge management tools. Tools that incorporate strategically designed settings to enable informed communication, cooperative analysis, review and decision making now have the potential to enhance human capabilities for more creative 'actions' and expanded awareness. A CHAT research approach recognizes the dynamic nature of the complex activities carried out by people within an organization. The contradictions between and within activities can be a source of organizational learning and knowledge creation.

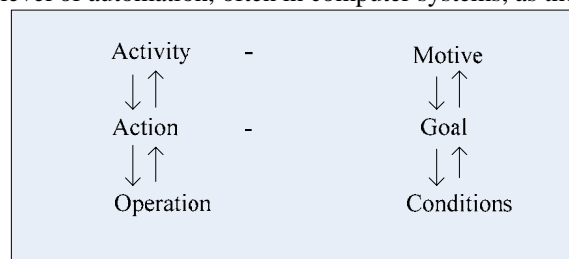
There are several researchers ( Choo<sup>[2]</sup>. Blackler<sup>[25]</sup>. Engestrom<sup>[26]</sup>. Kuutti and Virkkunen<sup>[4]</sup>. Hasan<sup>[27]</sup> ) who are using frameworks based on the CHAT for the study of technology, cultural, organizational and managerial issues and their work has had a strong influence on the approach adopted in this paper. The CHAT approach of Engestrom is particularly well known. His work uses cycles of expansive learning shown in Figure 5, and demonstrates positive interventions into activity systems can promote growth and innovation<sup>[28]</sup>. This is not unlike the knowledge spiral of Nonaka and Takeuchi where the contradictions between tacit and explicit knowledge promotes new learning. Whereas most approaches to date categorise or reconcile the anomalies and dichotomies that arise in KMS, CHAT welcomes these as contradictions that stimulate the activities into a more advanced state.





**Figure 5 Engestrin's Cycle of Expansive Learning Shows How Contradictions Within and Between Human Activities Enable Them To Grow**

Another well-known structure giving another dimension to activity is the hierarchy of Leontiev. Leontiev, a student of Vygotsky, was the first to propose that ‘activity’ should be the unit of analysis in the study of sustained human endeavour and placed this at the top of the hierarchy shown in Figure 6, associated with purpose and motive. This is a conceptual level above the level of goal-oriented actions at which most business analysis takes place. Activities are carried out by a collection of actions, undertaken towards specific, and often short-term, goals. Under certain conditions, conscious actions can be driven to a lower level of automation, often in computer systems, as they become standardized.



**Figure 6 The Hierarchical Structure of Activity**

In the design of KMS a unit of analysis is required that will encompass the many diverse and contradictory elements in KM. There are candidates such as knowledge objects, knowledge assets, knowledge-creating activities<sup>[14]</sup> and knowledge management episodes, such as making a decision, solving a problem conducting an experiment and performing a scenario analysis<sup>[15]</sup>. Fowler<sup>[29]</sup> approaches this diversity by noting that it is important to recognize the existence of different ways of conceptualizing and representing knowledge through, for example, anecdote, metaphor or diagram. The same piece of knowledge can be used in different ways, depending on the context and transformation process involved in satisfying goals from information inputs.

The advantage that a CHAT-based framework has for the design of KMS is that it uses activity, purposeful human work, as an explicit unit of analysis. An activity is defined by the relationship between an individual or collective subject (people) and their object of work related to its purpose and motive. This relationship produces both intended and unintended outcomes and is mediated by tools and

the community in which the subjects conduct the activities. Information, knowledge and language would all be seen as tools that mediate activities. The authors propose that these elements of activity, as defined in CHAT, could be used as the basis of a dynamic knowledge repository in a KMS, with 'activity' as the basic unit, not unlike the use of an 'object' in object-oriented systems.

The following section of the paper presents some outcomes of a study where CHAT has been used as the theoretical framework. The study uses the CHAT approach to improve the university's existing KMS. A significant outcome of the study was recognition of the importance of adopting a holistic approach to KM, which is cultural, historical, contextual and dynamic.

## **6 The University Study**

### **6.1 The development situation of KMS in the university**

Originally, the university took two projects:

(1) The DW (a data-warehouse of student course information for line managers)

(2) A campus-wide infrastructure (CWIS) to manage communications and access to computing resources

Practice indicated that the DW and the CWIS were relatively static and the Intranet had been greatly expanded to provide online information from former paper-based documents such as course requirements and timetables, procedure manuals, reports and soon. In addition, most staff and student transactions could now be submitted by forms on the web. The university has won awards for its use of Internet technology for flexible administration and teaching across multiple sites, an indication that this is effective and innovative. However negative consequences of the automation of student enrolment, reported by one academic student advisor, were the lack of personal contact, diminished control over student choices and having no feel for the type and number of students entering his program of study. There was also much tension evident between the market-driven focus of administrative staff and the teaching styles of academics manifest in continued arguments about quantity, versus quality, of students. The new technology enabled the easy processing of more students and allowed diverse forms of course delivery, including remote sites, but this increasing the complexity of the work of teaching staff with a lack of support in critical areas, such as moving subject delivery into the new flexible mode. With more work at the coalface, academic staffs were disillusioned with the lack of understanding, coherence and direction from the top concerning teaching loads and work practices in a climate where they were being asked to also increase their research profiles.

Two recent initiatives in the university were identified as involving KM issues. The first belongs to a business decision to outsource the unit responsible for student recruitment, which has now become an independent company located on campus. This unit developed its own database of course content and delivery information, designed to support the work of front-line customer service personnel taking inquiries from potential students in person, over the phone or online. This independent system of core business knowledge is not available to internal staff, several of whom reported that they would like access to this integrated collection of information both to support their work of advising students and to verify that the information was accurate and current. There is a strong belief by staff that this is not the case, as they identified many students entering the university on courses inappropriate to their needs and abilities. This is clearly a case of bad knowledge management both in the outsourced business arrangement and the maintenance of the CBIS.

The second initiative was the appointment of a Chief Information Officer (CIO) from industry who has been given the task of developing the new strategic plan for the university. The first draft of this, now distributed for comment, appears to lack a vision for KM. It mentions vague goals, such as growth in certain areas and the desire for an international reputation, but no indication of what criteria will be set to evaluate or measure these. While the new CIO is well respected, it is obvious that he has no historical and cultural knowledge, being neither an academic nor a long-serving member of the institution. There is a need for a chief knowledge officer (CKO) who, through experience, has an understanding or appreciation of the institutional culture, along the lines of that suggested by Earl and Scott.

### **6.2 Analysis by CHAT**

In summary, the innovative use of CBIS in the university falls into the following three categories:

(1) Extracting data from transaction databases on business performance for management decision making at various levels.

(2) Document management, procedure manuals, job descriptions, product descriptions, minutes of

meetings, reports now on Intranets with hypertext linked information architectures and search engines.

(3) The use of on-line, end-user forms to automate transactions and capture operational data.

Apart from standard Internet communications there are no knowledge sharing systems which attempt to codify tacit knowledge, identifying intellectual capital or encourage communications between knowledge workers, connecting experts with knowledge consumers. Indeed the new business imperatives push for increased competition and productivity, which actively inhibits the sharing of knowledge even within departments. The drive to be business-like is giving priority to the use of CBIS for basic operations but it is not being leveraged for higher-level knowledge creation, learning, and innovation. The CHAT model is shown in table 1.

**Table 1 CHAT Model**

Component	Definition and Clarification	
object	the purpose and motives that define the activity.	Stimulate the development
Activity		Use the projects
subjects	the person or people who carry out the activity	The teachers and students
tools/instruments	both physical and non-physical instruments that are used in the conduct of the activity	KMS
community	the community in which the subjects carry out that activity	The university and the social context
Outcomes	both intended and unintended results of carrying out the activity	Planned, Intended Outcomes Unintended Outcomes as mentioned above

### 6.3 Discussion

People at work in organizations need to 'know' in order to improve, innovate and survive. KMS have the potential to enable people working in ever more complex settings to take a fresh look at what they actually do, why they do it, in what context and with what tools.

From the study it could be seen that in the rush to become more business-like universities are turning to CBIS for KM in the hope that this will lead to increased productivity and a reputation for being at the forefront of innovation. Online information and transactions mean a faster turn around of data and more immediate information. However the use of CBIS is less personal and contextual and there is more responsibility on the user (often the customer). Universities can make innovative use of technologies, in particular the World Wide Web (WWW). Putting what were previously paper documents onto the web has several advantages, namely, greater flexibility in display and arrangement, the ability to maintain currency, less paper and greater access. However, there is still a need to learn how to use the new medium better and be sure equity of access and usability of the technology. KM efforts in this university were hampered by questionable business decisions, such as the outsourcing of customer resource management and bringing in someone, outside the organizational culture, to set the strategic direction. This shows that senior management lack an understanding of KM and the importance of the knowledge resource.

### 6.4 The results of the university study

(1) Organizational learning is a multifaceted and multi-phased phenomenon, a complex interplay between different elements of a system. It cannot be studied by reducing the scope to one or another element, but a minimum meaningful system as a whole should be taken as the unit of analysis and intervention.

(2) Organizational learning is always local and situational: structures, practices, habit and ways of thinking in an organization are all shaped and produced in the historical development of that particular organization. Transformation from the current situation to a new one cannot be done without a historical perspective.

## 7 Conclusions

The message of this paper is that current technologies may do little more than process data into information In the complex realm of organizational knowledge management, but they can be used judiciously in conjunction with new communication technologies to develop a more holistic, and

forward-looking KM approach.

Through the analysis as discussed above, CHAT may provide the means to do this effectively by focusing on forward-looking activities with their goals, motives, priorities, tensions, contradictions, changes and intentions. Such a framework is appropriate for both the study of knowledge management and for the design of knowledge management systems, which enable organizational learning and adapting. Indeed, in understanding the activities that create KMS, organizations may learn not only how to better manage knowledge, and foster new knowledge making, but also how to better use technology for more effective KMS.

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## Comparisons of Chinese & British University Library Homepages

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**Abstract:** This paper aims to find the distance between the university library homepages of China and of Britain, and point out a future developing direction of Chinese university library homepages. A statistic method and a comparison method are used, the frequency of some certain items in university library homepages in these two countries are compared. There are some differences in column establishment, layout design, color tone selection, media application between two countries' university library homepages, these differences manifest the features of two countries' university library, and reflect the gap of the design conception of library homepages between two countries. From a deeper level it also reflects the distance of service conception of university library between these two countries. From the viewpoint of humane and function, Chinese university library homepages should learn British university library homepages. This paper is a original study in the comparison between the Chinese university library homepages and British ones, and can help Chinese university libraries to improve their homepage design and idea of service.

**Key Words:** University library homepages; China; Britain; Comparison; Statistic

### 1 Introduction

With the universal digitalization and networking of university libraries, almost all colleges and universities have set up their own Websites and homepages respectively. The study of construction of university library homepages has get more achievements, the following aspects are particularly noteworthy:

The first is the design of university library homepages. Yong-Mi Kim raised a principle that the less complex a website's design is the more likely users will use it because of low strain on cognitive efforts.<sup>[1]</sup> Based on Nielsen and Tahir's criteria, Pamela Harpel-Burke compared 80 academic library homepages to business homepages, then he found that library homepage designs were significantly different from businesses for only four variables: the ability to search the website, the use of a search box or a link, the use of animation, and a change of link colors to indicate viewed links.<sup>[2]</sup> Laurel A. Clyde surveyed the home pages of public libraries and school libraries in 13 different countries (but he didn't compare these library homepages in different countries), then he concluded some features of the library home page, and he found that the most effective of the library Web sites or home pages appeared to be those that had a clear sense of purpose and a clear sense of the needs of users.<sup>[3]</sup> Fan Cui-ling summarized some problems of homepages construction in Chinese university libraries, such as web organization, establishments of columns, esthetics, and so on, and put forward some countermeasures.<sup>[4]</sup>

The second is the redesign of university library homepages because of the quick developments of technology of information and computer. Dominique Turnbow et al described the redesign processes of the UCLA Library Website, then a complicity user-centered sample was given.<sup>[5]</sup> Junior Tidal described the process of redesigning Ursula C. Schwerin Library's homepage, and he gave some recommendations to improve the usability of library homepage.<sup>[6]</sup> Fan Ai-hong analyzed the reconstruction of website of Tsinghua University Library, and summarized some successful experiences.<sup>[7]</sup>

The third is the evaluation of university library homepage. Junior Tidal and his team used both a user survey and two usability tests to test visitors' interactions with the library homepage, and the evaluated key points is the most commonly used links – finding books and articles, the library's hours, and reference support – were exclusively featured on the homepage. Sandra Shropshire examined four case studies, and identified the salient issues in library Web site direction.<sup>[8]</sup> Using a complicated statistic, Lisa Finder, Valeda F. Dent, Brian Lym found some pages of Hunter College

Library are not easy to use, while the others are easy to use because of more efficient placement, layout and functionality of certain features in the pages.<sup>[9]</sup>

Although there are some fruits in the study of university library homepages, there is still an inadequacy in these studies, which is the methods of survey-statistic and of international comparison have not been combined yet. So there is still exploring space in clearing realization of the characteristics and deficiencies of university library homepages in China, and thus the countermeasures to improve them is still lack of specificity. Foreign university library homepages design may not be fully better than those of China, but through comparing the gap to further optimize China university library homepages design is still a constructive idea, which is the purpose of this article.

Based on above conceptions, attempting to mainly use quantitative statistical analysis, this paper compares some main Chinese and British university libraries homepages and draws two kinds of service concepts. The writer selects 50 British famous universities and 100 Chinese famous universities as samples simultaneously to investigate the situations of these libraries homepages, and examines their differences by statistical analysis, at the same time, makes a summary and analysis of the disparities in the service concepts which behind differences.

## **2 The Column Establishment of Two Counties' University Libraries Homepages**

Overall, the amount of columns in Chinese university libraries homepages is much more than in British. According to statistics, in the samples, the average of columns in British university libraries homepages is 10, but in Chinese is 13.6. There are 22 sections in British university libraries homepages, the average frequency of 45.5%, but 23 in Chinese, 59.2%, which reflects that in respect of the column sequencing of the same frequency, British university libraries homepage is far ahead of Chinese's. This inevitably leads to enrich content of Chinese university libraries homepages, but meanwhile readers, sometimes, would ignore the most primary information that is submerged in a large number of columns after entering homepages.

The statistics of the sample shows (table 1), the navigation bar appears very frequently in both Chinese and British university library homepages and are close to or at 100%. This explains the importance of the navigation bar, thanks to that people need to enter next stage of windows of library homepages. The other two important items of those two university library homepages are the library catalog and electronic resources and electronic library (Elibrary), ranking into the top three, which connect with both sides recognizing the main task of library homepages: telling readers the service concept, what resources are available.

University library homepages in both countries usually have two columns, the help and the feedback from readers, for improving service quality and attaching importance to readers' views. In Britain, the frequency of occurrence of these two columns is up to 74%, tied for the fifth, and in China, is respectively 88% and 66%, ranked as fifth and thirteenth. This means that they all are aware of the need of improve the quality of service.

But then some differences have arisen in the two sides which first manifested in the understanding of the depth and convenience of information retrieval service. The fourth important item in British university library homepages is the keyword search window which can be used to retrieve sites within the library or can also jump to the school homepage site, providing convenience to readers who search relational news within the school information network. But this ranks only 19th in Chinese university library homepages. Besides, an item of a high frequency in British is the A-Z Index, up to 54%, ranking 10th. Yet this highly effective search entrance that has never been used in China is regretful. As similar as the A-Z Index, the frequency of the item, subject retrieval and characteristic resources, is up to 64% in Britain, ranking 8th; 34% in China, just 18th. Accordingly, the frequency occurrence of the item, subject retrieval, is 12% in Britain, but 1% in China. The subject retrieval and characteristic resources are major construction direction for modern libraries to get out of homogenization, and the former which is developed on the basis of the traditional catalog search is the development direction of information retrieval services. Evidently, there are significant differences in service concept and level of two countries.

**Table 1 Items Distribution of Two Counties University Library Homepages**

	UK			China		
	The number of corresponding homepages	The frequency of occurrence in the sample (%)	The order of the frequency of occurrence	The number of corresponding homepages	The frequency of occurrence in the sample (%)	The order of the frequency of occurrence
Navigation bar	50	100	1	98	98	1
Catalogue of collection in library	45	90	2	98	98	1
Electronic resources or electronic library	40	80	3	98	98	1
Keywords search	38	76	4	25	25	19
Help	37	74	5	88	88	5
Feedback	37	74	5	66	66	13
Library information	36	72	7	94	94	4
Subject resources and characteristic resources	32	64	8	34	34	18
Opening hours	28	56	9	72	72	9
A-Z Index	27	54	10	0	0	24
Catalogue search	26	52	11	68	68	11
User login and account information	25	50	12	36	36	17
Quick link and related sites	20	40	13	67	67	12
Library introduction	14	28	14	82	82	6
Branch library	10	20	15	25	25	19
Mobility information section	7	14	16	0	0	24
Subject retrieval	6	12	17	1	1	23
Lending regulations	6	12	17	59	59	15
Other resources (videos, photographs, manuscripts, etc.)	5	10	19	10	10	21
Books recommended by readers	5	10	19	66	66	13
New resources	3	6	21	39	39	16
Honors of university or library	3	6	21	0	0	24
Library forum	0	0	22	9	9	22
Thesis submission	0	0	22	70	70	10
Reference advisory	0	0	22	79	79	7
Library exchange	0	0	22	77	77	8

There is another window both sides pay attention to, that is library information and news. In samples, the frequency of occurrence of this part in British university library homepages is 72%, while as high as 94% in Chinese, which indicates that this window is very common in both sides. But as far as



the content of news and information concerned, the content which has nothing to do with the information retrieval appears in domestic university library, such as leader inspection, library activities and so like; conversely, the content in British university library homepages is just introduction and publication of information resources, consolidation and relocation of library, academic activities held in the library and other purely academic and resource retrieval activities. This reflects that the basic orientation of British university library is academy-oriented, academic independence and service-oriented.

There are other two items of differences worth noticing: brief introduction of library and borrowing requirements. In Britain, the frequency of brief introduction of library is 28%, ranking No.14; in China, is up to 82%, ranking No.6, which proves that British university library is more low-key, pragmatic and even more confident: some information readers understood doesn't need to be introduced. As for borrowing requirements, the frequency in Britain is 12%, ranking 17th; in China is 59%, ranking 15th, the slightly higher location. This illustrates that the lighter preaching colors of British university library; of course, it maybe is related to more conscious readers, while the heavier didactic colors and more obviously normative of Chinese university library

There are two items that make us a particular deep impression in the British university library homepages. One is a mobility information section, designed for providing the close service to action-impaired readers, which reflects humanity of British university libraries, but the cell deep spirit of individualism in western developed countries. The frequency of occurrence of this window is 14%, while it almost do not seen in domestic university library homepages or public library homepages. In our sample, the frequency of this part is zero. This gap is worthy of our deep introspection. The other one is honors of university or library. Its frequency of occurrence in British homepages is 6%, not that high, but compared with zero in Chinese, the number is quite good. The comparison shows that people would work more confident and feel more a sense of accomplishment in British university libraries. In contrast, it seems difficult to link up a sense of accomplishment with working in Chinese university libraries.

### **3 The Layout of Chinese and British University Library Homepages**

The layout design includes the height, the bar number and the partition number of the homepage, the location of the navigation bar and so on.

How much high is appropriate for the height of a university library homepage? Statistical results (table 2) shows that in 80% of the total number of British sample, the height is no more than twice of the computer screen, and it is a convenient height readers can easily drop down to the end of pages, would not lead to dizziness caused by the rapid drop-down and contains regular item content. 12% of homepages are even just a screen height, compact and simple, no extra information, and no ornate decoration, which reflects the pragmatism tendency of British university library homepage design. In China, 52% of homepages are more than twice height of computer screen, and only 48% of homepages are not higher than twice height of it. That is the result above mentioned that bar number of Chinese homepages is much more than British's. This also means that, in Chinese university library homepages, finding some information needs to scroll down the homepage many times, but in British university library homepages, just once.

Another point should be noted in the layout design is columns and zoning of the layout. The column can effectively shorten the length of the horizontal saccade of eyes, and improves the efficiency of visual response. But too many columns also affect the efficiency. In 50 British university library homepages, only 2 are no column, 5 are divided into two columns, 14 are no less than four columns, and the layout divided into three columns is really dominated (table 3), accounting for 58%. This column, relatively consisted with reading habits, is varied but also does not seem too trivial. On the contrary, in 100 Chinese homepages exist opposite situation. Only 30% of the homepage column is divided into no more than three columns, and 66% more than four columns, which are bound to fragmentary interface, and also increased the difficult level of information search.

In addition to the column, both of them commonly use partitioning approach (table 4), dividing homepages into several horizontal area from the top to the bottom. 10 British university library homepages are divided into two areas, accounting for 20% of the total; 28 three areas, accounting for 56%, which constitutes the main body of layout design partition; and 12 no less than four areas. Chinese has different distribution of partition of homepages. 34% of homepages are divided into two areas, 32% three areas, 24% four areas, more dispersed, unlike the partition of British university library homepage

is mainly concentrated in three areas.

**Table 2 The Height of Chinese and British University Library Homepages**

The height proportion(A) of homepage to computer screen	UK			China		
	The number of corresponding homepages	The proportion of simples (%)	The order of the frequency of occurrence	The number of corresponding homepages	The proportion of simples (%)	The order of the frequency of occurrence
A=1	6	12	4	1	1	5
1<A<=1.5	15	30	2	26	26	2
1.5<A<=2	19	38	1	21	21	3
2<A<=2.5	9	18	3	15	15	4
A>2.5	1	2	5	37	37	1

**Table 3 The Layout Column of Chinese and British University Library Homepages**

The largest number of columns	UK			China		
	The number of corresponding homepages	The proportion of simples (%)	The order of the frequency of occurrence	The number of corresponding homepages	The proportion of simples (%)	The order of the frequency of occurrence
1(No column)	2	4	4	0	0	4
2	5	10	3	4	4	3
3	29	58	1	30	30	2
4 or more than 4	14	28	2	66	66	1

**Table 4 The Layout Partition of Chinese and British University Library Homepages**

The largest number of areas	UK			China		
	The number of corresponding homepages	The proportion of simples (%)	The order of the frequency of occurrence	The number of corresponding homepages	(%)The proportion of simples (%)	The order of the frequency of occurrence
1(No area)	0	0	5	0	0	5
2	10	20	2	34	34	1
3	28	56	1	32	32	2
4	9	18	3	24	24	3
5 or more than 5	3	6	4	10	10	4

Besides, the placement of navigation bar in British university library homepage is arranged in a way of respecting the traditional reading habit. The left side of homepage is the preferred location of the navigation area, followed by the upper position. Statistics manifests 82% of total sample are designated navigation area in these two locations in British university libraries. But in China, this proportion is much lower, only 51%, while homepages whose navigation area is not located in these two locations accounts up to 39% of the total, which is a rather high proportion. Apparently, British homepages are more in line with the reading habits of modern people: enter the page from top left. But Chinese homepages are designed less consideration of the habit, and it seems to that its man-machine interface not very friendly.

#### 4 The Color Tone of Chinese and British University Library Homepages

The color design of the library homepage focuses on the processing of tone. Colors of British university library homepages dominate by blue tone, 72% of samples mainly using blue or involved blue. And in Chinese homepages, the proportion is also up to 66%. This shows a common philosophy of these two countries libraries: the library is an academic workplace with calm, and objective of academic activities & criteria of independence should be presented in library homepages. The blue tone is easier for people to get a psychological suggestion to calm down, which is consistent with the mood needed in academic activities. 6 British university library homepages are designed in red and similar red as a main

tone, only 12%. It thought that far higher proportion of red tone would be arranged in Chinese university library homepages, after all, Chinese prefer the red, but the surprising statistics shows that only 9% of homepages use red tone, even lower than the UK. That is to say, in library homepage design, the calm and the rationality are widely accepted.

It is worth noting that less purple tone in the Chinese web design, nevertheless it takes a place in color design in British university library homepage. 4 homepages are purple tone. Although the proportion is not high (8%), it is pretty high compared to zero in Chinese web design. In addition to the above tones, British libraries rarely use other colors. Green -- Another Chinese people's favorite color is rarely showed in color tone design of British university library homepage; while in China, the proportion is 7%. In addition, some homepages have no clear main tone in both sides (mainly white background). This proportion of Chinese library homepages is higher than British's: the former is 10%, the latter 2%. It means that layout of British homepage is more concise but paying more attention on adjusting to visual effect by colors; Chinese homepages are more inclined to complex partition variety.

**Table 5 The Color Tone of Chinese and British University Library Homepages**

Tone type of homepage		UK			China		
		The number of corresponding homepages	The proportion of simples (%)	The order of the frequency of occurrence	The number of corresponding homepages	The proportion of simples (%)	The order of the frequency of occurrence
Blue tone	Blue	23	46	1	44	44	1
	Blue-gray	9	18	2	4	4	7
	Other color related blue	4	8	4	19	19	2
	Total	36	72		67	67	
Red and similar red tone		6	12	3	9	9	4
Purple and similar purple tone		4	8	4	0	0	8
Green and similar green tone		1	2	7	7	7	5
Other color		1	2	7	7	7	5
No obvious color		2	4	6	10	10	3

## 5 The Usage of Visual Media in British and Chinese University library Homepages

Both sides design homepages by use of various visual media, but have different preference. Statistics (table 6) shows that only one homepage (DMU) in British university libraries does not use any visual medium, and 49 use a variety of them, which is an absolute majority. For Chinese homepages, this proportion is as high as 100%.

However, the library, after all, is an academic service organization. Its object is relatively stable. Its primary means to attract readers is the academic content and literature search of literature or resources of their collections accessible and convenient extent, rather than fancy visual form. The usage of visual media just to give readers more comfort in the process of retrieval literature, meanwhile to allow readers to get a hint of emotion: this is a relatively objective and dispassionate academic information exchange intermediary. It clearly is not an art window for the purpose of aesthetic, and thus using visual media, designers of UK do both use and play a variety of visual media, and also avoid a result of overwhelming and even affect the functions of information inquiries because of too much visual media. In this way, it can be say that "modernism" this quality has been fully embodied in the use of visual media in various library homepages. In 50 British university library homepage design, only 2 use video, accounting for only 4% of total samples; only 9 use Flash, 18%, not high, which indicates that British homepages are not characterized by the visual impact. In China, although the sample does not appear video, the proportion of the use of Flash animation is as high as 66%, which tends to pursue the visual impact.

Both sides extensively use images and icons, the former is larger, the reproducibility, the latter is relatively small, abstract and indicative. British university library homepages which use images are 39,

accounting for 78% of total samples, those which use icons are 46, 92%; in china, the proportion respectively are 80% and 71%. Highly use of icons in UK indicates that design of library homepage should be more emphasis on the indicative, rather than the reproducibility. Different with British homepages, Chinese one is more inclined to images instead of icons. Together with the above mentioned about large numbers of Flash animation, they attract readers by the vivid means of media, which has obviously been the impact of websites in society, and what calm and rationality academic institutes need is highlighted not enough.

**Table 6 The Visual Media of Chinese and British University Library Homepages**

The visual media type	UK			China		
	The number of corresponding homepages	The proportion of simples (%)	The order of the frequency of occurrence	The number of corresponding homepages	The proportion of simples (%)	The order of the frequency of occurrence
Video	2	4	4	0	0	4
Flash	9	18	3	66	66	3
Image	39	78	2	80	80	1
Icon	46	92	1	71	71	2

## 6 Conclusion

Through comparison between Chinese and British university library homepages, it is not difficult to find that there are some conspicuous differences in the understanding of the service concept of library which is a relatively independent complementary unit of academic research, following conclusions can be drawn out:

1) Typical British university library homepages possess the height of homepages limited in less than two times of screen, layout arrangement mainly led by three columns and three areas, navigation bar located in the left and top of the interface, respecting the reading habits of modern man; in color tone design, they commonly use blue-oriented and occasionally red and purple; in application of visual media, they less use means of video and Flash animation, but more use traditional media such as images and icons. Whereas typical Chinese university library homepages possess the height of homepages is mostly more than two times of screen, more than four columns, no obvious difference in cutting area, arbitrary location of navigation bar in the interface, no much consideration of reading habits; in color tone design, they commonly use blue-oriented and occasionally red and green; in application of visual media, they often use Flash animation.

2) British university library homepages is characterized by good function, concise and simple interface, and calm-and-rational-oriented psychological intimation, etc. Chinese university library homepages have not bad functions as well, but too many optional items influent the efficiency of getting information, at the same time, they ignore apparent inclination of differences which between library homepages' and regular social websites'. Besides, they blindly copy the portal site homepages' features, chasing visual impact, complex content and layout, which is no match with academic orientation.

3) Both sides have their failures. For British university library homepages, some of them are far too simple, a small part of them are short of a unified sense of order, and they fully reflect the principle of modernistic function above all and the design concept of neglecting form. For Chinese university library homepages, they are too complicated and trivial: too rich and not well organized content, too active and impulsive interface. Function-only and the shortage of form result in unsuccessful works in British university library homepages; form-only and the shortage of function bring about failures of Chinese university library homepages. Admittedly, it is Chinese university library homepages that have serious problems.

4) The contrast of the advantages and the disadvantages of university library homepages of two countries implies the improving direction of future China university library homepages: more emphasizing the function and appropriately diluting the form, more emphasizing the academic characteristics and appropriately keeping away from common portals, more corresponding to the ergonomics and avoiding the violation of perceived psychology and reading habits. Furthermore, more attention should be paid on in-depth service philosophy, we should consciously learn British university libraries. British university library homepages reflect British university library's respecting readers, more humanity services, efforts to refine service quality, function first and any other concepts which

should be praised and confirmed, and they should be the good example of Chinese university libraries.

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# Analyses on Risks of Intellectual Property Rights in Enterprises' International Operations\*

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**Abstract:** It successfully applies the method of interdisciplinary research, and it conducts a mathematical model to analyze. Risks of intellectual property rights, which enterprises confront during international operations, are comprehensively analyzed from political, legal, economic, market, technology, culture and operations management aspects. And on this base, a financial method about analyzing risks of security investments is proposed, and the mathematical model concerning the risks of intellectual property rights during international operations of enterprises is established, then a quantitative analysis is conducted. It comes to a conclusion that risks of intellectual property rights can be measured. The model is of great importance for enterprises to do with precaution, protection and management of intellectual property rights accurately.

**Key words:** International operations of enterprises; Risks of intellectual property rights; Risk factors; Mathematical model analysis

## 1 Introduction

With China's accession to the WTO, domestic enterprises face more and more fierce international competitions, and internationalization becomes an inevitable development road. However, in the process of international operations, domestic enterprises face a lot of risks, including the risk of intellectual property rights, which is one of most important and frequent risks. The gradually maturing external condition, the intellectual property rights as the asset with independent commercial value to participate in the financing load, essentially can support growing food for cultural enterprise lacked of fixed asset and fund. (Wei Yaping, Yang Jianping, 2006) The financial crisis across the world leads domestic export enterprises especially high technological enterprises to go bankrupt or be on the brink of bankruptcy, and the global economic situation is seriously bad. The research and developing feature of high technological enterprises makes them confront various crises and disasters in intellectual property rights field. (Wei Chen, Guan Jianxin, 2007) Under this background, more and more Chinese enterprises gradually realize the importance of intellectual property rights. There have been many domestic and overseas studies concerning intellectual property rights and the protections and managements. Tang Heng points out that effectively recognizing and controlling risks of intellectual property rights is the guarantee for victory of enterprises' market competence. (Tang Heng, Zhu Yu, Jin Yucheng, Liu Jia, 2007) Tod Mongan thinks technological enterprises should execute routine check of risks of intellectual property rights. (Tod Mongan, 2005) However, few has yet studied these from the view of quantitative analysis. For this, on the basis of comprehensively analyze risk factors that enterprises face during international operations, it innovatively guides into analytical method of security investment risks to establish risk analysis model and makes quantitative analyses, which provides risk-prevention-and-control references of intellectual property rights for enterprises undertaking international operations.

## 2 Analyses on Risk Factors of Intellectual Property Rights during Enterprises' International Operations

Enterprises will face a series of risks during international operations, and in the case of risks of intellectual property rights, it mainly includes seven aspects of risk factors: the political risk factors, the legal risk factors, the economic risk factors, the market risk factors, the technology risk factors, the culture risk factors and the operations management risk factors.

### 2.1 The political risk factors

Intellectual property rights is an enterprise's strategic resources, and during an enterprise's international operations, its political risk factors mainly include all countries' strategy formulation and implementation of intellectual property rights; the instability of all countries' policy of intellectual

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property rights; and regional group development of the world economy.

## **2.2 The legal risk factors**

There are two legal risks: one caused by legal system, and the other caused by legal reality. As intellectual property rights has the character of legal exclusivity and reproducibility, besides, it can bring an enterprise with huge economic benefits, as a result, during the process of management and application, an enterprise' intellectual property rights may have the legal risk of being imitated, faked, leaked out, registered and so on. (Jiang Zhihong, 2010) Management of legal risks has increasingly become an important strategic means for all countries' enterprises to grab domestic and foreign markets. However, Chinese enterprises show weak consciousness, backward system, and insufficient input problems in the management of intellectual property rights, thus they pay a painful price in the increasingly fierce market competitions. The legal risks of intellectual property rights have big effects on international operations of an enterprise, and there are two main factors, including legal risks brought by world convergence of intellectual property laws and different limitations on intellectual property rights.

## **2.3 The economic risk factors**

### **2.3.1 Economic risks brought by the change of economic conditions**

Economic conditions an enterprise face in international operations mainly conclude: natural resources, human resources, the economic basis, and the investment and financing environment, and the change of these conditions will bring the enterprise with economic risks during international operations. (Zhou Yongming, 1994)

### **2.3.2 Economic risks brought by the change of economic policies**

Due to different economic developing levels, different countries will implement different economic policies. However, the economic developing level and economic status of a country are not unchangeable, and its economic policies will change accordingly, and change of some economic policies would bring enterprises, hosted by this country, with different economic risks during international operations. The change of economic policies related to intellectual property rights would also bring enterprises with economic risks during international operations.

## **2.4 The market risk factors**

Under the conditions of market economy, market risk is inevitable for any economic participation body, especially for enterprises undertaking international operations.

During international operations, due to different factors, not all countries have the same requirement and standard for one product, and different markets also have different consumption demands. With the constant expansion of financial innovation fields, securitization of intellectual property rights assets get a rapid development. On the trade process of securitized assets, speculation is not rare, and this accelerates the market price of intellectual property rights to change.

## **2.5 The technology risk factors**

The maturity and reliability of a technology are essential to its successful transformation. Some core technologies of an enterprise's intellectual property rights are likely to face technology risks in the concrete implementation process. That is to say, technological achievements can't or can't successfully transform into real productivity, and it may cause uncountable losses to the enterprise.

## **2.6 The culture risk factors**

Whether international operations of an enterprise will succeed, it is not only due to consideration of factors like products, market and technology, but also to analyses of culture differences. Culture risks of intellectual property rights during enterprises' international operations mainly perform in the following two aspects: interior fusion and exterior cooperation of operation and management of intellectual property rights.

## **2.7 The operations management risk factors**

Under different political, economic and culture backgrounds, an enterprise has different operation and management ways and different operation and management ways of intellectual property rights. Facing the increasingly complex international environments, an enterprise often suffers huge losses during international operations, as a result of improper operation and management.

# **3 Mathematical Model Analyses about the Risks of Intellectual Property Rights during International Operations of Enterprises**

For the mentioned risk factors of intellectual property rights enterprises confront during international operations, the following mathematical model will do quantificational analyses.

## **3.1 Lead-in of the model**

Generally speaking, risk is the probability an investor would suffer losses, and in financial terms,

the accurate meaning of risk is to deviate from the expected earnings, and it is the same with the risk of intellectual property rights an enterprise confronts during international operations. There are so many factors cause the deviation, including the mentioned seven risk factors.

**3.2 Basic assumptions of the model**

The model includes four basic assumptions:

- 1) The market is strongly effective;
- 2) Enterprises are only faced with risks of intellectual property rights during international operations;
- 3) There are only seven risks of intellectual property rights, including the political risk, the legal risk, the economic risk , the market risk, the technology risk, the culture risk and the operations management risk;
- 4) There are only four economic statuses, including bad, so-so, good and very good.

**3.3 Establishment of the model**

3.3.1 The measure of overall risks of intellectual property rights an enterprise confronts during international operations

1) The way to measure overall risks

The measure of risks of intellectual property rights an enterprise confronts during international operations can be realized by calculating the standard deviation or variance of return rate. According to the definition on statistics, the variance of return rate of intellectual property rights can be calculated by the following formula:

$$\sigma^2(R) = \sum P_i * [R_i - E(\tilde{R})]^2 \quad (i=1,2,3,4) \tag{1}$$

Among them:

$P_i$  means the happening probability of return event of intellectual property rights under different economic statuses;

$R_i$  means the return rate under different economic statuses;

$E(\tilde{R})$  means the expected return rate of intellectual property rights.

2) The specific operations to measure overall risks

In most cases, the return rate of intellectual property rights will change along with economic statuses, and it's more obvious under the increasingly complex international environments. In the model, there are only four economic statuses, and it makes some assumptions of the return rates and their happening probabilities under every economic status, as the following table shows:

**Table 1 The Measure of Overall Risks of Intellectual Property Rights**

Economic Status	Probability	Return Rate
Bad	0.14	-0.2
So-so	0.3	0.1
Good	0.4	0.2
Very Good	0.16	0.5

So, the expected return rate of intellectual property rights is:

$$E(\tilde{R}) = 0.3 \times 0.1 + (-0.2) \times 0.14 + 0.5 \times 0.16 + 0.2 \times 0.4 = 0.162$$

Then, apply formula (1), and we can get the variance of the expected return rate of intellectual property rights:

$$\begin{aligned} \sigma^2(R) &= \sum P_i * [R_i - E(\tilde{R})]^2 \\ &= 0.3 \times (0.1 - 0.162)^2 + 0.14 \times (-0.2 - 0.162)^2 + 0.16 \times (0.5 - 0.162)^2 + 0.4 \times (0.2 - 0.162)^2 \\ &= 0.0203 \end{aligned}$$

According to the definition of variance, we get to know that in this assumption, the value-at-risk of intellectual property rights of this enterprise is 0.0203.

3.3.2 The measure of specific risks of intellectual property rights an enterprise confronts during international operations

3) The way to measure specific risks

In the model, it makes an assumption that during an enterprise's international operations, there are



only seven mentioned risks of intellectual property rights, and these seven risks are calculated by losses under certain probabilities, and here is the formula:

$$R_m = P_m * L_m \quad (2)$$

( $m=1,2,3,4,5,6,7$ ; and 1 represents political risk of intellectual property rights, 2 represents law risk of intellectual property rights, 3 represents economic risk of intellectual property rights, 4 represents market risk of intellectual property rights, 5 represents technology risk of intellectual property rights, 6 represents culture risk of intellectual property rights, 7 represents operations management risk of intellectual property rights)

Among them:

$R_m$  means the size of the specific risk  $m$ ;

$L_m$  means the loss caused by the specific risk event  $m$ ;

$P_m$  means the happening probability of the specific risk loss event  $m$ .

4) The specific operations to measure specific risks

According to different industries and different sizes of enterprises, the influences of different risks of intellectual property rights are also different. In the model, we take a group of data for instance, as the following table shows:

**Table 2 The Measure of Specific Risks of Intellectual Property Rights**

Specific Risks	Loss(L)	Probability of Loss(P)	Size of Risks(R)	Weight of Risks(W)
Political Risk (1)	50000	0.002	100	0.216
Law Risk (2)	30000	0.003	90	0.194
Economic Risk (3)	80000	0.0004	32	0.069
Market Risk (4)	60000	0.0005	30	0.065
Technology Risk (5)	70000	0.0001	7	0.015
Culture Risk (6)	20000	0.0002	4	0.009
Operations Management Risk (7)	40000	0.005	200	0.432

From the table, we can obviously find, in this assumption, different specific risks of intellectual property rights have different influences on enterprises' international operations. In practical operations, we can refer to the model, and combine with the characters of different enterprises.

## 4 Conclusion

It comprehensively analyzes seven main risks of intellectual property rights, including political risks, legal risks, economic risks, market risks, technology risks, culture risks and operations management risks, and their influencing factors. On this base, it establishes a mathematical model centered with two formulas to measure overall and specific risks of intellectual property rights during enterprises' international operations respectively. And this is a great innovation. The model and its quantificational analyses may lead enterprises undertaking international operations to locate in international markets specifically, and to make schedules about precaution, protection and management of intellectual property rights accurately. However, it's just a model which rejects some real conditions, and scholars can do deeper researches to consider more market factors to complete this model and help enterprises win in practical international operations.

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# Applicability of Knowledge Management in Managing Venture Capital Fund

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**Abstract:** Based on the description of the conception, the demanded resources, the objective and the control process of venture capital fund, this paper will analyze the important use of the knowledge in venture capital fund, the mode of operation for venture capital fund and we will elaborate the characteristics and the classical operation mode of venture capital fund management. Then this paper will design one mode through the process of knowledge management. At last, we can get the conclusion that knowledge management is the most important element of venture capital fund management and how we should use knowledge in venture capital fund.

**Key words:** Venture capital fund management; Operation mode; Knowledge management; VaR

## 1 Introduction

Venture capital plays a crucial role in transferring science and technology to practical productivity and in promoting economic growth and social progress. With the growth of the venture capital industry, the venture capital fund has become the core mode of venture capital. As fund managers, the venture capital fund management company is a key part of the venture capital. Its efficiency and effectiveness directly affect the consequences of running the venture capital. Therefore, the investigation on the organization and operation of a venture capital fund management company is extremely important on improving its performance.

In current years, venture capital is one of the focuses of academic research in China. Most researches of venture capital investigated it from “macro” to “micro” levels, and the study that focus on the operation mode was rarely mentioned. Since operation mode is crucial to the effectiveness of venture capital. In the era of knowledge economy, the foundation of venture capital industry, VC companies’ core-competitiveness and development potential are all closely linked to knowledge of management team. In order to add value to an enterprise by using knowledge, effective techniques and tools are necessary for knowledge management. As a new concept and model of modern management, knowledge management has increasingly become the focus of venture capital industry and a key factor to find the competitiveness of a VC fund. The establishment of a knowledge management system is the basis of knowledge management. With the growing awareness of knowledge management, many venture capital companies have begun to apply knowledge management and knowledge management systems. Few companies have introduced the concept, even developed the culture of knowledge management, and developed knowledge management systems. Some VC companies succeed, some companies failed. There are many reasons that some VC companies failed to develop knowledge management systems, one of significant factors is the failure of risk management. Some project managers ignore risk management. The lack of risk-control places risk into disaster, and finally lead to the failure of knowledge management system project. How to improve the success rate of knowledge management systems, and effectively reduce and control the risk has become an important theoretical value and practical significance. This paper is trying to elaborate the importance of it to improve the management of the venture capital fund in our country.

## 2 Essence of Venture Capital Fund Management: Knowledge Management

### 2.1 The main resources of venture capital fund management: knowledge

In Economics, the typical resources are land, labor, capital, and later the entrepreneurs become the forth factor of production. Currently, with the continuous development of technology and productivity, knowledge gradually gets rid of its dependence on other production factors and becomes an independent resource, which plays an increasingly important role in economic development and social progress.

Leading resources is the dominant resources that among those that create wealth. During different economic era, the leading resources are different. In the agricultural economy era, land is the leading resource. In the industrial economy era, capital is the leading resource. In the era of knowledge economy which is on the horizon, knowledge will become the dominant resource.

The venture capital process is the process of combining capital with knowledge. The leading resource for venture capital fund management is knowledge rather than capital, which can be proved by borrowing the concept of organizational capital and social capital. According to Phillips Specter and Wesker's discourse, knowledge is the basic source of organizational capital. As Keli Man said: "capital is the most typical social capital, organizational capital is dedicated and hidden, while social capital is a common and dominant under normal circumstances, the enterprises will be constrained by organizational capital and social capital, the level of knowledge is not the same as it when enterprises are mainly subject to the constraints of social capital (such as a shortage of funds), social capital will play a leading role in the enterprise, when the enterprise was mainly due to organizational capital constraints, the knowledge will play a leading role in the enterprise. " For the venture capital industry, the scarcity is not the money, but the knowledge of operating funds. Therefore, in the venture capital fund management, knowledge is the leading resource. Through the development that direct investments mode transferred into the principal-agent mode, we can see that: for venture capital firms, knowledge as organizational capital is more scarce than the fund as social capital; knowledge is more restrictive than fund in the venture capital fund management. Hence, knowledge will replace the capital to become the leading resource for venture capital fund management.

According to the decision theory, decision should be made by the one who have the related knowledge. In general, in the venture capital industry, while venture capital investors are responsible to the final decision making, venture capital fund management teams own the knowledge for the decision making. In the early stage of development of the venture capital industry, investment was mainly in the direct investment mode. In this mode, the final decision maker and the knowledge owner is one entity (investors used their own capital for risk investment. They not only had capital but also had the knowledge and experience for making investment decisions).With the development of the venture capital industry, the principal-agent model gradually occupied a dominant position. In this new mode, the final decision maker and knowledge owner are separated. Hence, the agency relationship is formed. However, the principal-agent mode produces much cost, since the learning is needed for acquiring knowledge and learning produces need much cost. Moreover, it is difficult for the final decision maker to learn all the effective knowledge. Therefore, in the venture capital industry, the original decision maker transfers the decision-making power to the knowledge owner, which is the professional venture capital fund management team. This is also the reason why commission management system is dominant form of the venture capital organization in developed countries. Such an alienation of decision-making power also illustrates the dominant role of knowledge in the venture capital industry. Therefore, knowledge is the leading resource in venture capital firms.

## **2.2 The organizational characteristic of the venture capital fund management: a knowledge-based organization**

The basis organizational characteristic of the venture capital fund management is knowledge. Venture capital fund management companies can be regarded as a knowledge-based organization. Knowledge-oriented resources are the dominant resources of knowledge-based organization; the creation of knowledge, transfer and use of the capacity are the core competitiveness of the organization to provide knowledge-based product or service. First of all, the provision of knowledge-based products or services for customers is the fundamental means to profits for knowledge-based organization. It is also the fundamental way to display the organization's objectives. Second, organizational knowledge is the leading resource of knowledge-based organization. There are a variety of resources in the organization, and they work together to achieve organizational goals. In knowledge-based organizations, knowledge will become the leading resource; it is in a dominant position in a variety of resources. Again, the knowledge acquisition, use and creation ability of organizations will become the fundamental source of core competitiveness in the knowledge-based organization.

From the above, knowledge is the leading research that achieve the goal of venture capital. The most fundamental products and services that it has provided is knowledge (i.e., value-added services). The source of its core competitiveness is the knowledge and ability that company used to provide value-added services. Therefore, venture capital is a knowledge-based organization, and these features will give an important and far-reaching impact to its organizational design and management of production.

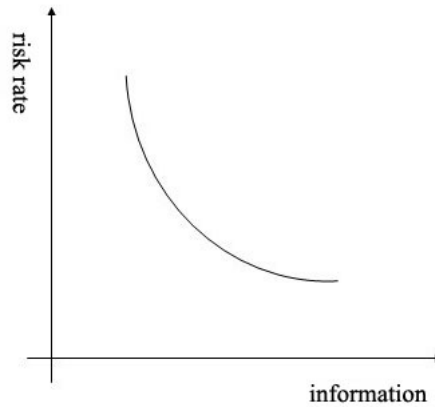
## **2.3 The objectives and forms of venture capital fund management: knowledge**

The rise of the venture capital industry is due to the large inflow of money to the industry. The purpose of the entry of funds is to obtain high profits. In the principal-agent mode of venture capital, company must give sufficient returns as the managers of venture capital venture capital fund

management. This is the only possible way that venture capital can raise the appropriate capital for the next round of investment. Therefore, the pursuit of profit becomes the primary objective of the venture capital in order to obtain considerable returns.

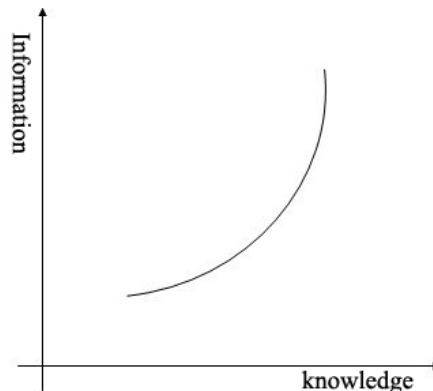
The customers of the venture capital are venture firms or risk projects. Generally speaking, they have two demands: capital and value-added services. Venture capital fund is the combination of capitals and technology. The effectiveness of this combination depends largely on the degree of integration of management and technology, which means that it depends on the value-added services, such as strategy, management and social network resources which are provided by the venture capital fund management company. The process of venture capital is not the one-way selection from venture capital investment fund management companies to risk enterprise (or risk project). While venture capital firm selects the best venture capital, but the most suitable venture capital. To risk enterprises, venture capitals that provided by different venture firms have basically no difference. What attract venture businesses are value-added services, which are provided by venture capital. Moreover, the value-added services of the investment risk are from the knowledge of the company's venture capital fund management team, as well as the company's organizational knowledge. Therefore, knowledge is a fundamental product of the venture capital firm.

High risk is the characteristic of the venture capital industry. Venture capital firms gain profits through the effective management of risk, and get its achieve its organizational objectives. Risks can be understood as an uncertainty of results. There is a negative correlation between uncertainty and available information.



**Figure 1 Relationship of Information and Risk Rate**

As shown in Figure 1, venture capital firms grasp information more fully, the investment risk becomes smaller. Moreover, the ability of acquiring knowledge is stronger, the quality is higher. Figure 2 can infer the relationship that risk and knowledge is negatively correlated. In other words, the more knowledge that the more venture capital firm holds, the higher the quality is. The stronger its investment risk management capabilities, the smaller the risk of their investment, as shown in Figure 3. Therefore, knowledge of the venture capital fund management is not only the fundamental guarantee of the venture capital risk management, but also the essence of venture capital to achieve its objectives.



**Figure 2 Relationship of Information and Knowledge**

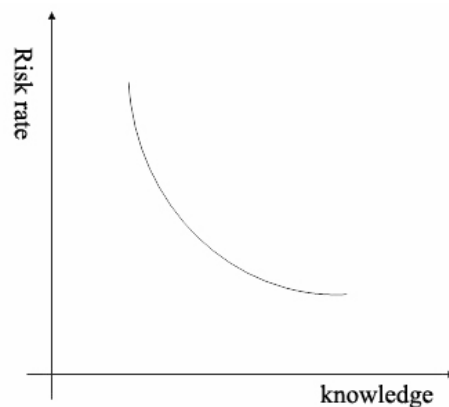


Figure 3 Relationship of Risk Rate and Knowledge

### 3 The Use of Knowledge Management in the Venture Capital Fund

#### 3.1 The basic situation of the venture capital fund

In 2009, the number of SMEs in China is over 4000, which accounts for more than 95% of the total number of enterprises in China. However, China's SMEs have been faced with the difficult problem of financing to handle large enterprise groups. In the actual economic life, besides dealing with its solid financial research, development and production of high-tech investment projects, there are limits in the financing of SMEs. Therefore, new channels of financing for SMEs' further development are needed. Under such condition, firstly, venture capital funds were invented by western countries. They specialized in high-risk investment fund. These companies recruited a large number of high level talents to good business venture capital, and they issued a considerable number of venture capital funds. These funds were invested into the SMEs projects that were valuable after careful screening. After the investment in venture capital funds to become successful, the venture capital fund transferred bribery by going to the public. Venture capital funds played a pivotal role in the economic development of countries in the Western, and they have made an invaluable contribution to the development of SMEs in these countries.

#### 3.2 Market risks management method in venture capital funds: knowledge Management

In the investment of venture capital funds, there are a lot of market risk, which refers to the changes in market factors and the decline in value of investment. In general, there are four categories of market risk factors, stock indexes, interest rates, exchange rates and commodity prices. Stock index risk is the risk of stock price fluctuations. Interest rate risk refers to the risks of interest rate changes. Exchange rate risk refers to the risks of changes in foreign exchange trading price. The commodity risk is the risk of changes in commodity prices. These risks may bring the risk of investment failure to the venture capital fund. Therefore, venture capital fund should use knowledge management to manage market risk.

##### 1) Identifying the market risk

The first step in risk management is to identify them. If we cannot correctly identify the risk, we will not be able to find legitimate ways to manage risk through knowledge management. Venture capital funds can observe the changes in interest rates and commodity price changes firstly, then detect the operation of the project to identify potential risks.

##### 2) Accessing market risk.

3) After venture capital funds find that the market risk, they should assess risk factors and potential loss. Knowledgeable staffs in venture capital fund can use historical data and statistical tools to create a unique style of risk assessment models and market risk assessment system. Through this model and evaluation system, the venture capital fund managers can identify and assess risk factors and make appropriate decisions.

##### a) The value of the absolute VaR: $VaR = w - w = -w\sigma$

b) Relative VaR is the loss of average expectations of a project. Absolute VaR is the loss with a project related to the initial value, not with the average expected Relative VaR takes time value into account, so it can reflect the true level of risk better. We can generalize the existing VaR methods into three categories: parameter method (including Risk Meteics and GARCH), non-parametric method (to

include Historical Simulation and Hybrid mode) and semi-parametric method (including extreme value theory Extreme Value Theory CAVIAR and like the maximum likelihood method, such as the GARCH). VaR is widely used in many fields. For example, JPMorgan uses VaR to build Risk Meteics model in order to manage the market risk; banks use VaR to manage market risk.

#### 4) Management of market risk and feedback

After the staff of venture Capital Fund found the potential market risk, venture capital funds should take measures to manage risk and minimize the loss of these measures. These measures include the long-term investment in different types of small and medium-sized enterprises and the Financial Street tools include: Forwards, futures and options to hedge against market risk. At the same time, venture capital funds should refuse to provide more funds for SMEs. When SMEs encounter serious market risk, venture capital fund should establish early warning systems and appropriate management mechanism, and it should change the traditional risk management models. In order to establish an early warning and feedback mechanisms, venture capital funds should firstly create database and risk management models. Then, venture capital funds should take advantage of the validity of the data to test models and the applicability of early warning systems. Finally, venture capital funds should update the data of SMEs and timely adjust the investment strategy to manage market risk and to obtain more return.

Venture capital fund is with implicit knowledge and explicit knowledge. Implicit knowledge is the knowledge of the inner sentiment, such as know how and professional thinking, while explicit knowledge can be expressed by equations and other knowledge and can be used for risk management. Therefore, venture capital funds should firstly formulate the strategy of knowledge management, then using knowledge management to manage market risk.

### 3.3 The process of the knowledge using

#### 3.3.1 Building a knowledge database

Since venture capital funds have more and more information and risk information of small and medium enterprises and investment projects, venture capital funds must establish a database to manage these information. Through the database, the venture capital fund is able to query, analyze and share the project information of small and medium-sized enterprises, and then analyzing and monitoring the information and risks. Therefore, they can propose appropriate strategies to manage these risks

#### 3.3.2 Managing creative knowledge

Because venture capital funds have a lot of experts and knowledgeable staff, venture capital funds should motivate employees to learn more knowledge and creative work. Through the creative work of the knowledgeable staff, the venture capital fund will be able to find the profitability of the project and to manage risks for more returns.

## 4 One Design of the Ventures Business System Concerting on Knowledge Management

According to the organizational characteristics and operational characteristics of the venture capital firms, venture capital firm's business process system can be horizontally divided into strategic management, investment management and knowledge management. The strategic management process subsystem describes the company's strategic planning and business processes. Investment management process subsystem is a venture capital firm's business processes; it is prescribed according to the kind of operation that be used to access risk capital, the management and how to cast the risk of corporate divestment. The venture capital firm's investment management business processes subsystem is actually a process that providing services to create value for customers. It is also a basic value-added process of the venture capital firm. Knowledge management processes subsystem is an assurance process of, venture capital firm. This regulates the company's access to knowledge. By the process of knowledge creation and knowledge application, it provides protection to the company's value-added process.

Pressing business process system of venture capital firms, in the horizontal, can be divided into three business processes subsystem, and the various business processes subsystem pairs, in the vertical, can be down decomposition. Strategic management process subsystem can contain the company's strategic planning process and the company's business process management process. The operation capacity of the business process is an important foundation for companies to obtain competitive ability, so the company cannot fail to give sufficient attention to the base business process system. Since business process design and optimization is not easy, we need to be adjusted accordingly based on base operation and the company's internal and external environment. Therefore, the company should have a standardized business processes to guide the work. The company's investment management process

subsystem including the company's financing, investment, divestment, and the tube of the invested enterprises. The company's knowledge management process subsystem is the process of creation, dissemination, sharing and application process so that organizes knowledge. All we know is the leading resource for venture capital firms. Knowledge management capacity is the key to maintain sustainable competitiveness lies, because knowledge management process is the core of the company's business process system. Knowledge management processes are closely related with the company's investment, financing, and value-added services. In essence, knowledge management processes are the knowledge support for finance, investment, value-added services and the divestment process. On the other hand, the activities of these business processes are the source of knowledge for knowledge management processes. They both tend to integrate as a whole, and it is difficult to clearly distinguish between them. Figure 4 is a business process architecture diagram in the venture capital firm, which can clearly describe the architecture of venture capital firm.

The business process system of venture capital firms can be fatherly divided in the vertical direction, until the activity levels. This will constitute the system, which is a crisis-cross network-based business process, to improve operational efficiency and effectiveness.



**Figure 4 One Business Process Architecture Diagram in the Venture Capital Firm**

## 5 Conclusions

This paper explores the meaning of venture capital funds and knowledge. Then it analyzes the necessity and feasibility of knowledge management in venture capital funds. Eventually, this paper claims the method how to use knowledge management to manage market risks. Through our research, we discovered that we should construct venture capital funds starting from designing strategy for knowledge management, which should be used to manage the market. Specifically, doing venture capital funds should establish database and VaR model at the beginning, then use these to evaluate and calculate the market risks of the invested small and medium-sized enterprises. What's more, the managers should use the diversified investment strategy, as well as financial street derivative to hedge the market risk. By using knowledge management, venture capital fund can provide funds for small and medium-sized enterprises, meanwhile obtaining profits through market risk management.

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# Effects of Information Technology Function on Tacit Knowledge Transfer Effectiveness\*

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**Abstract:** This paper empirically analyzes the effects of information technology function on tacit knowledge transfer effectiveness. The functions of information technology are summarized as follows: feedback, symbol variety, parallelism, rehearsability, reprocessability. The effects of information technology function and the moderating effects of common experience of both sides on tacit knowledge transfer effectiveness are analyzed through multiple linear regression model. The results show that, feedback, parallelism, rehearsability, reprocessability functions of information technology have a significant impact on tacit knowledge transfer effectiveness. Meanwhile, the familiar degree of both parties involved in knowledge transfer, and the familiar degree between the exchange theme and both parties have positive moderating effects on tacit knowledge transfer effectiveness based on information technology.

**Key words:** Tacit knowledge; Information technology; Knowledge transfer; Transfer effectiveness; Multiple linear regression model

## 1 Introduction

With the market competition becoming increasingly fiery, knowledge has become the core resource in the enterprise. It is also the important means to obtain competitive advantage of enterprises. Business and academic circles begin to widely pay attention to knowledge management. One of the important goals of knowledge management is: "The right knowledge is transferred to the most appropriate person at the right time". The main strategy of knowledge sharing and exchanging is that the two parties involved in knowledge exchange need to stay in the same place, at the same time to carry out the knowledge exchange activities. However, under the background of economic globalization, the enterprises geographically dispersed degree is increased. Many businesses are operated in other regions and countries. Knowledge exchange is affected by time difference, space difference, and social difference. This problem is alleviated a large extent by information technology (IT). Many experts and scholars have discussed in theory: "How to effectively use information technology?" Roberts & Lowry have studied the effect of knowledge transfer on team with the application of information technology. They suggested that information technology could decrease the negative effect caused by the expansion of the team size<sup>[1]</sup>. Chen HW & Zhu WF suggested that one of the main measures of promoting tacit knowledge communication was the application of information technology. But some scholars put forward the different views<sup>[2]</sup>. Cooper thought the effect was not significant in tacit knowledge transfer with using information technology<sup>[3]</sup>. The inner mechanism of tacit knowledge transfer with using information technology will be further explored in this paper. Information technology has the five functions, which are feedback, symbol variety, parallelism, rehearsability, reprocessability. The relationships of IT functions and tacit knowledge transfer effectiveness are analyzed. The moderating effects of the common experience in tacit knowledge transfer are analyzed, which about the relationships of the familiar degree of two parties, and about the relationships of the familiar degree between both parties and the communication theme.

## 2 Literature Review

### 2.1 Tacit knowledge

Polanyi presented the concept of tacit knowledge in 1958. He thought that knowledge could be coded which was explicit knowledge, knowledge could not be coded which was tacit knowledge<sup>[4]</sup>. Nonaka & Takeuchi thought that tacit knowledge was highly individualistic, difficult to formula, difficult to communication, and rooted in action and specific situation<sup>[5]</sup>. In addition, some other

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scholars on tacit knowledge also put forward own viewpoint. Nelson & Winter thought that tacit knowledge was the skills of people in the action<sup>[6]</sup>. Durcker thought that tacit knowledge was derived from experience. It could not be interpreted with the language. And it could only be demonstrated that was exist<sup>[7]</sup>.

## **2.2 Tacit knowledge transfer mode**

Knowledge transfer refers to knowledge sharing within the organization or organizations across the borders. Teece first put forward the concept of knowledge transfer. He pointed out that the knowledge transfer could help enterprises to accumulate the valuable knowledge and promote the technology diffusion. Thus the technology gap between regions was narrowed<sup>[8]</sup>.

There are many ways of tacit knowledge transfer. Currently the main tacit knowledge transfer mode includes: flow of personnel, training, observation, technology transfer, copy path, patent, scientific publications and lectures, the exchanges of suppliers and customers, alliance and so on.

## **2.3 Influence factors of tacit knowledge transfer**

Knowledge transfer has been certain affected by knowledge sender and acceptor characteristics. On the one hand, the knowledge sender has to have the cooperation and the will of knowledge transmission. The motive of the knowledge sender is the key factor of knowledge transfer success. The higher knowledge sender wishes, the more knowledge and information can be obtained by the knowledge acceptor. On the other hand, the absorption abilities of knowledge acceptor also affect knowledge transfer effectiveness. The more strong absorption abilities is, the more effective holding and using these opportunity to obtain new knowledge.

## **2.4 Influencing factors of tacit knowledge characteristics**

Knowledge characteristics which effected knowledge transfer mainly included: causal ambiguity, knowledge tacit degree, embedability.

Causal ambiguity refers to causal relationship between action and result is uncertainty. The bigger causal ambiguity is, the more difficult to identify the relevant knowledge element is. Simonin systematic studied the effect of knowledge transfer based on knowledge ambiguity. The results showed that knowledge ambiguity had negative moderating effects on knowledge transfer effectiveness<sup>[9]</sup>.

Knowledge tacit degree refers to knowledge was difficult to express with text, charts, and language. The greater knowledge tacit degree is, the more difficult knowledge transfer carries out.

Embedability refers to the knowledge cognitive characteristics. It exists in different levels, such as person, organization, product, tools and technology, organizational task, organizational networks and so on. Cummings & Teng pointed out that knowledge was contained in different carriers, and the difficulty of transfer would be different<sup>[10]</sup>.

## **2.5 Situational influencing factors of tacit knowledge transfer**

Situational features of knowledge transfer includes: trust, previous experience, relationship strength, similarity of knowledge background, organization culture and other aspects.

Soekijad pointed out that good previous experience for the alliance or specific partner had a positive effect on promoting the knowledge transfer, because previous experience could make the enterprise to realize the value of new knowledge, and to absorb it, and to apply it<sup>[11]</sup>.

A bigger difference still exists in the academic circles about the effect of knowledge transfer on knowledge background similarity. On the one hand, many scholars thought knowledge background similarity had a positive effect on knowledge transfer. Nonaka pointed out knowledge overlapping and similar experiences could contribute to knowledge transfer<sup>[5]</sup>. On the other hand, some scholars thought knowledge background similarity had a negative effect on knowledge transfer. Burgelman thought that the knowledge difference was too smaller to lose the power to learn the new knowledge for knowledge receiver<sup>[12]</sup>.

Organizational culture is an important factor of knowledge transfer too. Even though knowledge transfer mechanism is rather mature, it may not be possible to get the expected result, it determinants in organization knowledge sharing culture.

## **2.6 IT influencing factors of tacit knowledge transfer**

Some scholars explained how to realize knowledge transfer through analyzing various functions of new media. Dennis & Valacich put forward the media synchronicity theory. The theory indicated that the exchange process could be divided into two processes: transmission and convergence. The media function of IT is divided into five aspects: feedback, symbol variety, parallelism, rehearsability, reprocessability. The five functions could affect for the efficiency and effectiveness of two exchange process<sup>[13]</sup>.

### 3 Theories and Hypotheses

#### 3.1 The relationships of IT function and tacit knowledge transfer effectiveness

Tacit knowledge is the knowledge based on long-term accumulation of experience that is un-formal, highly personal, and subjective. Tacit knowledge transfer is usually through association learning theory. The first the both sides of transfer study, running-in, forming a common language, then transfer using language. The association learning process need to have enough time. If the feedback function is too strong, and the feedback speed is too fast, then it is not conducive to transfer of tacit knowledge. Therefore, this paper put forward the following hypothesis:

Hypothesis 1: Feedback function of IT is negative correlation to tacit knowledge transfer effectiveness. That means the stronger feedback function of IT, the worse the effect of tacit knowledge transferring.

Hypothesis 2: Symbol variety of IT is positive correlation to tacit knowledge transfer effectiveness. That means the more the express way of IT option has, the better the effect of tacit knowledge transferring.

Hypothesis 3: Parallelism of IT is negative correlation to tacit knowledge transfer effectiveness. That means the more the number of user in exchanging with IT, the worse the effect of tacit knowledge transferring.

Hypothesis 4: Rehearsability of IT is positive correlation to tacit knowledge transfer effectiveness. That means the stronger rehearsability of IT, the better the effect of tacit knowledge transferring.

Hypothesis 5: Reprocessability of IT is positive correlation to tacit knowledge transfer effectiveness. That means the stronger reprocessability of IT, the better the effect of tacit knowledge transferring.

#### 3.2 The moderating effects of common experience

The common experience of both parties involved in tacit knowledge transfer includes: the familiar degree of both parties and the familiar degree of exchange theme. If both sides involved in tacit knowledge transfer are familiar, the expression way of one side is fit the thinking habit of the other side. The tacit knowledge of transferred will be easier to understand by both parties. If both sides of the knowledge transfer are familiar to the exchange themes, the thinking time of knowledge transfer can be reduced. Therefore, this paper put forward the following hypothesis:

Hypothesis 6: The familiar degree of both parties has positive moderating effect on relationship between the function of IT and tacit knowledge transfer. That means in the same conditions, the more familiar the exchange partner, the better the effect of tacit knowledge transfer.

Hypothesis 7: The familiar degree between both parties and exchange theme has positive moderating effect on relationship between the function of IT and tacit knowledge transfer. That means in the same conditions, the more familiar the exchange theme, the better the effect of tacit knowledge transfer.

### 4 Questionnaire Design and Data Acquisition

#### 4.1 Questionnaire design

This paper adopts the method of questionnaire to collection data. The questionnaire uses Likert 7 scale. The object of investigation is the managers of the enterprise. They frequently use the IT tools in their practical work. 150 questionnaires are issued and 112 questionnaires responded. Response rate is 74.67%. There are 97 valid questionnaires. Valid rate is 64.67%.

#### 4.2 Variable measures

Questionnaire design references to the related research results of many scholars.

In the questionnaire reliability aspect, Cronbach's  $\alpha$  coefficient is used to test scale internal consistency. The Cronbach's  $\alpha$  values of all variables are greater than 0.70. Thus the sample reliability passes internal consistency test.

In the questionnaire validity aspects, factor analysis is used to verify. KMO and Bartlett globular test are used to test the correlation between each item. The results show that, the various indicators are passed with the Bartlett globular test ( $P < 0.0001$ ). KMO values can satisfy requirements of factor analysis.

### 5 Empirical Analyses

Multiple linear regression analysis is used with SPSS17.0 software in this research. In order to eliminate multicollinearity problems, the factor values of independent variable, Moderating variables

and dependent variable are centrally processed. The results of regression analysis are on table 1.

**Table 1 The Effect Between the Five Functions of IT and Tacit Knowledge Transfer**

Regulating variables	No Regulating variables	The familiarity of both parties	The familiarity of exchange theme
Variables			
Feedback	-0.132**	0.175**	0.046
Symbol variety	0.03	0.07	0.115*
Parallelism	-0.092*	0.163*	0.082
Rehearsability	0.245**	-0.089	-0.102
Reprocessability	0.253**	0.098	0.104
R square	0.518	0.587	0.563
adjusted R square	0.506	0.562	0.536
changed R square		0.069	0.045
F	38.187**	21.471**	20.462**

\*express  $P < 0.05$  significantly, \*\*express  $P < 0.01$  significantly

### 5.1 The effects of the five functions

Table 1 shows that, in the regression model, the cumulative rate of interpretation is 51.80%. F is 38.187. It is significantly under  $P < 0.01$ . According to the data in Table 1, the results in Table 2 are obtained. Table 2 shows that, hypothesis 1, 3, 4, 5 are supported, and the hypothesis 2 is not supported.

**Table 2 The Effects of The Five Functions of IT**

Hypothesis	Content of Hypothesis	Is supported?
Hypothesis 1	Feedback has negative correlation to tacit knowledge transfer effectiveness.	supported
Hypothesis 2	Symbol variety is positive correlation to tacit knowledge transfer effectiveness.	not supported
Hypothesis 3	Parallelism is negative correlation to tacit knowledge transfer effectiveness.	supported
Hypothesis 4	Rehearsability is positive correlation to tacit knowledge transfer effectiveness.	supported
Hypothesis 5	Reprocessability is positive correlation to tacit knowledge transfer effectiveness.	supported

### 5.2 The moderating effects of the common experience

Table 1 shows that, in the regression model, the cumulative rate of interpretation is 58.70% when the moderating variable is the familiar degree of both parties involved in tacit knowledge transfer. And the cumulative rate of interpretation is 56.30% when the moderating variable is the familiar degree between both parties and exchange theme. F is 21.471 and 20.462 respectively. They are significantly under  $P < 0.01$ . According to the data in Table 1, the results in Table 3 are obtained. Table 3 shows that, hypothesis 6 and hypothesis 7 are supported.

**Table 3 The Moderating Effects of Tacit Knowledge Transfer**

Hypothesis	Content of Hypothesis	Is supported?
Hypothesis 6	The familiar degree of both parties involved in tacit knowledge transfer has positive moderating effect.	supported
Hypothesis 7	The familiar degree between both parties and exchange theme has positive moderating effect.	supported

## 6 Conclusion

The five functions of IT tool are summarized: feedback, symbol variety, parallelism, rehearsability, reprocessability, based on the review of previous related literature of knowledge transfer. The empirical analysis of the effects between the five functions and tacit knowledge transfer has carried out. The empirical analysis of the moderating effects of the common experience of both parties on tacit knowledge transfer effectiveness has carried out too. The results show that, feedback, parallelism, rehearsability, reprocessability functions of IT have a significant impact on tacit knowledge transfer effectiveness. However, symbol variety of IT has not significant impact on tacit knowledge transfer. Meanwhile, the familiar degree of both parties involved in knowledge transfer has positive moderating

effects on tacit knowledge transfer effectiveness based on information technology function. The familiar degree between the communicating subject and both parties has positive moderating effects on tacit knowledge transfer effectiveness based on information technology function too.

In addition, some useful conclusions are obtained in this paper. At the same time, there are some shortages. It is to be improved in the further research. For example, the scope of investigation will be further expanded. The more influence factors will be considered, such as organization culture, trust, and so on.

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# External Network, Absorptive Capacity and Performance: the Affecting Mechanism\*

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**Abstract:** Performance is an important goal for enterprises. With the development of globalization economy and knowledge economy, networks have become an important way to improve enterprise performance. While, however, most of the existing research on the impact of enterprise external network on its performance merely emphasize the role of their network location and neglect the heterogeneity themselves, and thus, leading to contradictory conclusions. In this paper, external network is the independent variable, absorptive capacity is the intermediate variable, enterprise performance is the dependent variable. The paper conducts a further study on the subject, set up the mechanism of enterprise external network affecting its performance.

**Key words:** Enterprise external network; Absorptive capacity; Concept model; Profit performance; Innovation performance

## 1 Introduction

The concept of absorptive capacity arose from the macro level and was first used to analyze technology catching-up of lagging countries. In the book "Economic Backwardness in Historical Perspective", Gerschenkron(1962) given the concept of backward advantage, he pointed that lagging countries can utilize tacit knowledge from the world, therefore, lagging countries have more growth potential than developed countries. Rapid growth potential depends on many factors such as the natural endowments and the country's social competence. Among these factors, technology matching ability are the most important ones (Abramovitz, 1986). Absorptive capacity is an integral part of social competence, which affects a country's ability to absorb and assimilate knowledge from leading countries (Ohkawa & Rosovsky, 1973).

Cohen and Levinthal (1990) first introduced absorptive capacity into the level of the firm, they given that absorptive capacity refers not only the acquisition or assimilation of information by an organization but also the organization's ability to exploit it.

With the intensified of economic globalization and coming of knowledge economy, it is becoming more and more important for enterprises to make full use of its external resources, particularly knowledge resources. Thus, absorptive capacity as an enterprise's capacity to deals with information and knowledge, has received extensive attention from researchers. Through reviewing the related theory on knowledge absorptive capacity, not only have a systemic understanding on existing knowledge absorptive capacity researches, but also propose directions for further research.

## 2 Literature Review on Absorptive Capacity Model

### 2.1 The model of Cohen and Levinthal

The most widely used process model of absorptive capacity was advanced by Cohen and Levinthal (1990) that showed in Figure 1. They argued that absorptive capacity consists of the abilities to recognize the value of new knowledge, to assimilate it and to apply it to commercial. The three processes are dynamic and depend on the knowledge source and prior knowledge, and furthermore, they affect innovation activity and innovative performance of enterprise.

In this model, they not only firstly introduced absorptive capacity into the level of the firm, but also firstly analyzed absorptive capacity from the process perspective. Therefore, as enterprises' capacity to deal with information and knowledge, absorptive capacity make a reasonable explanation on static knowledge affected enterprise innovation process.

Besides all the above contributions, this model also had some limitations. On one hand, it ignored

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the process of knowledge acquisition, which was necessary in the whole process. On the other hand, it ignored enterprise profit performance, which was the most important goal for enterprises.

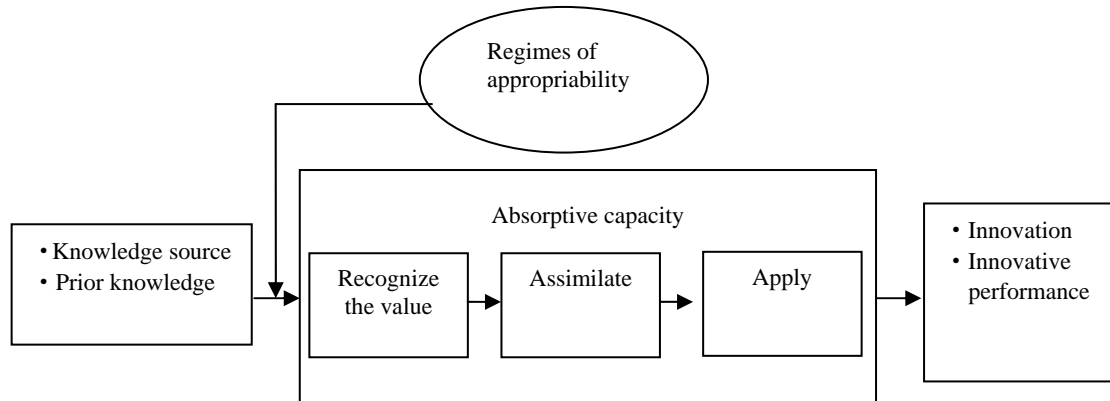


Figure1 Absorptive Capacity Model of Cohen and Levinthal (1990)

**2.2 The model of Zahra and George**

Zahra and George (2002) reconceptualized the concept of absorptive capacity, took absorptive capacity as a dynamic capability and proposed a new model showed in Figure 2. Absorptive capacity is a set of organizational routines and processes to acquire, assimilate, transform and exploit knowledge. Being a kind of capability, absorptive capacity focus on enterprise’s ability of managing its resources especially its knowledge resources, and this ability can improve enterprise performance and competitive advantage.

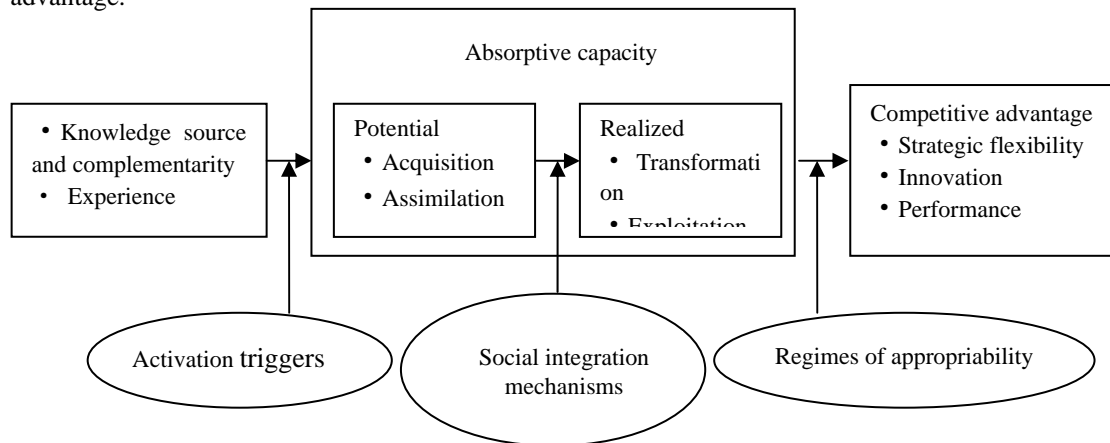


Figure2 Absorptive Capacity Model of Zahra and George (2002)

Different from previous researches, “cognitive” was replaced by “acquire” in their study, and absorptive capacity was divided into potential absorptive capacity (including acquire and assimilate knowledge) and realized absorptive capacity (including transform and exploit knowledge). Meanwhile, new concepts were raised such as activation triggers, social integration mechanisms and regimes of appropriability. Firstly, prior knowledge, knowledge source and complementarity are acquired and assimilated by enterprise under activation triggers. Then, they are transformed and exploited by social integration mechanisms. And under given regimes of appropriability, enterprise competitive advantage form (including flexibility, innovation and performance).

In this model, absorptive capacity was divided into two phases and competitive advantage included both innovation and profit performance. This gave valuable references for further study. However, it didn’t give in-depth analysis on the relations between these four variables.

**2.3 The model of Todorova and Durisin**

Based on empirical research, Todorova and Durisin (2007) reconceptualized the concept of absorptive capacity that has five elements including recognize the value, acquire, assimilate, transform and exploit, showed in Figure 3. They reintroduced the concept of recognizing the value, and argued that transformation represents an alternative process linked to assimilation. Besides social integration

mechanism, they proposed power relationships as the new contingency factor. And meanwhile, new feedback links was added to reflect the dynamic aspect of absorptive capacity.

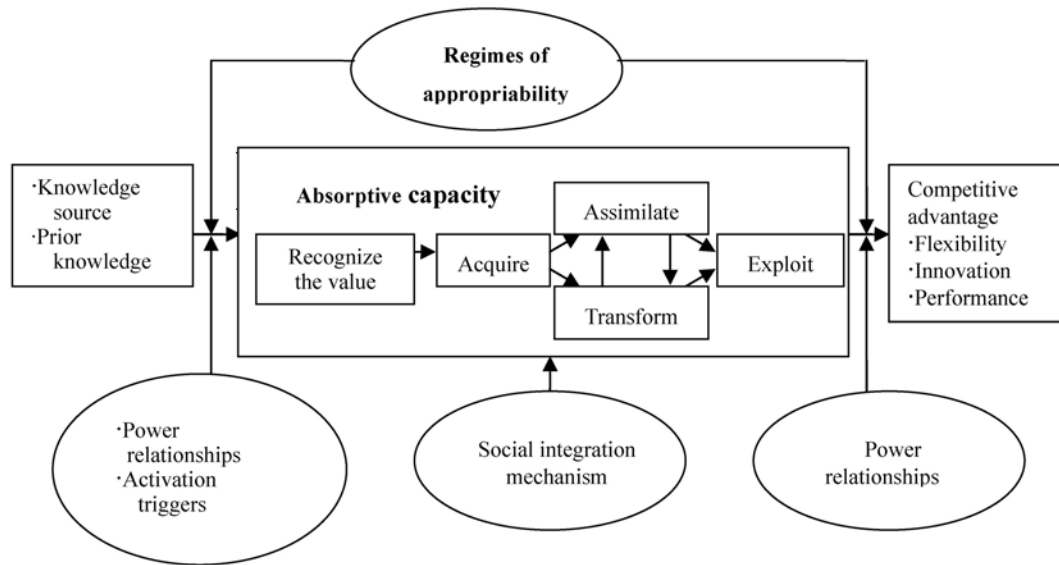


Figure 3 Absorptive Capacity Model of Todorova and Durisin (2007)

This model gave a reasonable division on absorptive capacity, but still didn't make a clear explanation on different absorptive capacity stage and different competitive advantage content.

### 3 Mechanism of Absorptive Capacity Acting

The above models on absorptive capacity and competitive advantage give enlightenment for related study, however, there are some limitations at the same time. Firstly, all the above models assumed that there was a knowledge source, more specifically, they assumed that there was no difference between different enterprise knowledge source. Thus, none of them made a specific analysis on enterprise different knowledge sources and ignored the role of enterprise external network. Secondly, all the above models didn't make a clear explanation on different absorptive capacity stage and different competitive advantage content. Competitive advantage includes several dimensions, which are decided by different factors. Different dimension of absorptive capacity certainly influence different dimension of competitive advantage. However, this relation is not clearly explained in the above models.

#### 3.1 Theoretical analysis

Enterprise external network is a kind of relation between external free market and internal organizations. Enterprise external network is not only the collection of enterprise relations but also the collection of resources contain in these relations. Theoretically speaking, there are two aspects enterprise external network affected enterprise performance.

On one hand, enterprise external network is a kind of resource allocation system paralleling with enterprise and market. Enterprise external network directly affect its profit and innovation performance by way of network structure and network relation. This means that the specific network position itself is critical, the position determines the knowledge, information, capital and other resources for enterprises and furthermore affects enterprises performance, whether it is who in this place.

On the other hand, enterprise external network is a collection of potential resources filled with knowledge, information, capital and etc. These potential resources can be translated into real resources, and the conversion rate is determined by enterprises abilities of recognize, acquire, understanding and exploit resources. Only the translated real resources can affect enterprise performance, and thus, the enterprise itself is more important than the specific network position.

#### 3.2 Mechanism building

The mechanism building in this paper focus on the second theoretical aspect. That is, though enterprise external network do not affects enterprise performance significantly, it affects absorptive capacity apparently. Resources acquired from enterprise external network can only effective by way of being recognized, being gathered, being understood and being exploited. This process, in essence,



reflects the role of absorption capacity.

From the perspective of social network analysis, network structure and network relation are the two dimensions of it. Indicators of network structure include network size, network density, network centrality and network heterogeneity. The structural dimension concentrated not only resources given by enterprise position in the net but also arising from the ability possessing resources (Burt, 1992; Granovetter, 1973). Network structure impact on the flow of resources (Nonaka, 1994), thereby affecting enterprise absorptive capacity. And absorptive capacity furthermore, determines enterprise performance.

Network relation focus on the bilateral relations between a given ego and a given alter. It means that network relations can increase quantity of knowledge learn from others in the net (Dyer & Singh, 1998; Nahapiet & Ghoshal, 1998), based on these knowledge network relation affects enterprise performance significantly, while, the extent of this impact are decided by absorptive capacity.

Integrated previous literatures on absorptive capacity, this research redefines the concept of absorptive capacity. The essence of the absorptive capacity is a kind of accommodation capacity in the ever-changing business environment. The absorptive capacity is a processing ability including four dimensions, which are recognize the value, acquire resources, assimilate resources and apply resources.

On the basis of the above definition, the paper conducts a model of enterprise external network affecting its performance. The mechanism is shown in Figure 4.

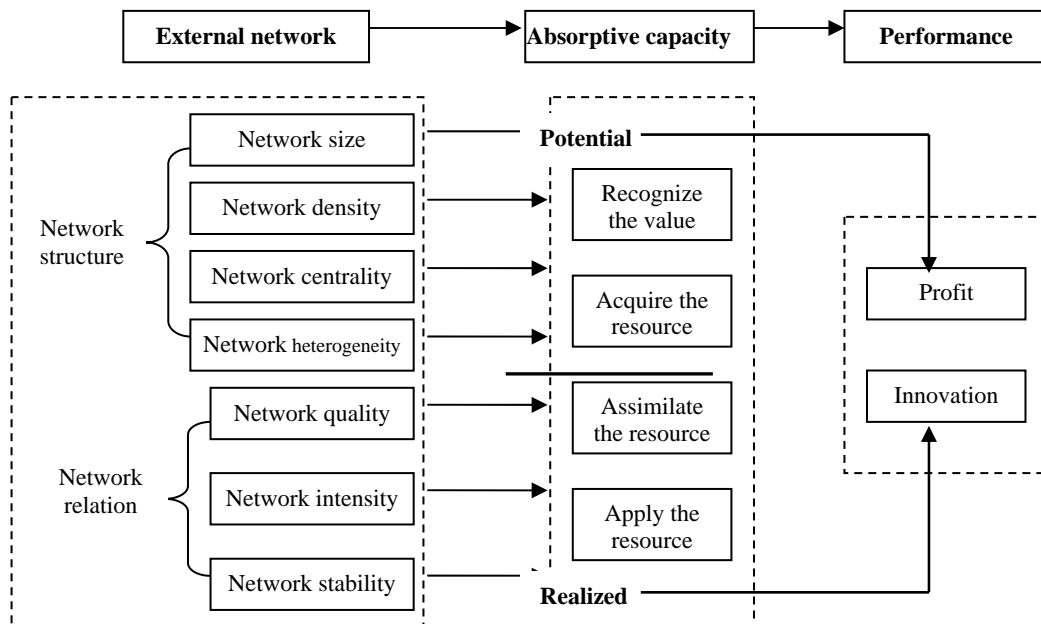


Figure 4 Mechanism on the Impact Enterprise External Network on Its Performance

Specifically, the absorptive capacity plays an intermediary role in the process of enterprise external network affects enterprise performance. Enterprise external network not only has a significant positive impact on enterprise performance, furthermore, the absorptive capacity, as the intermediate variable, decides the extent of this impact.

What's more, the potential absorptive capacity mainly affects enterprise profit performance and the realized absorptive capacity mainly affects enterprise innovation performance. The absorptive capacity can be divided into the potential absorptive capacity and the realized absorptive capacity. The potential absorptive capacity is the ability to recognize and acquire resources such as information, knowledge and technology. It represents the abundance of resources and mainly affects the profit performance. The realized absorptive capacity is the ability to assimilate and apply resources. It mainly decides the ability of innovation, and therefore, it affects both the innovation performance and the profit performance.

#### 4 Conclusion

This is the time of globalization economy and coming of knowledge economy, the competition among enterprises is fierce day by day. All these make it important for enterprises to communicate with

external organizations. The aim of the communication is to make full use of its external resources, particularly knowledge resources, and furthermore, improve enterprise performance. Essentially, the process of this communication is the process absorptive capacity acting. By introducing absorptive capacity, we can not only give a reasonable interpretation on enterprise differential performance in a cluster, but also give a guide for enterprise to keep competitive advantage based on this difference.

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## The Intellectual Structure of the Non-Technological Innovation Field: An Author Co-Citation Analysis

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**Abstract:** The non-technological types of innovation are neither clearly defined, nor are they differentiated from each other, from other forms of innovation, from innovation in general, and from creativity. Hence we use co-citation analysis based on bibliometrics to produce a quantitative literature review that results in identification of key areas of research within the non-technological innovation literature. It enables us to find out where the knowledge base comes from in each of the areas. By using authors as the units of analysis and incorporating all the citations that are included in the ISI Web of Science, we trace the evolution of the intellectual structure of the non-technological innovation field during the period 1975–2011.

**Key words:** Innovation; Non-technological innovation; Co-citation analysis

### 1 Introduction

In the last couple of years, non-technological innovation is becoming increasingly recognized as a previously often overlooked factor in the innovation literature that may serve as a promising component for enhancing business performance. It has been demonstrated that firms that introduce non-technological in addition to technological innovations outperform those firms that have introduced a new process without any organizational or marketing innovation (Schmidt & Rammer, 2007\_ENREF\_81). Therefore, understanding both non-technological and technological aspects of innovation is necessary to achieve optimal results in terms of innovation.

In practice, many managers are unaware of what constitutes the complex construct of innovation, especially the intangible part of innovation activities. Many confusing typologies and conceptualizations (Damanpour & Aravind, 2012) do little to help. Understanding innovation as a complex and multi-dimensional phenomenon remains a significant agenda for the researchers (Adams, 2003). Since innovation is based on continuous incremental activity, it is necessary to consider the complementary relationships between different types of innovation. By understanding innovation as a dynamic and multifaceted process, a more comprehensive account of organizational innovativeness will be obtained (Walker, 2008).

Some innovation scholars argue that innovation types may be artificial distinctions and are conceptually and operationally alike (Edquist, Hommen, & McKelvey, 2001). The dimensions of innovation, such as type, stage or radicalness of innovation overlap (Damanpour & Aravind, 2012) or are mutually dependent (Walker, 2008). There is no single coherent conceptual framework that would bring together all types and forms of innovation, especially non-technological innovation (Lam, 2004). Fragmentation of the field prevents us from seeing the relations between these facets, which ultimately impedes consolidation of the field (Crossan & Apaydin, 2010). Although several forms of non-technological innovation exist, non-technological innovation and its content are not clearly defined in the innovation literature.

This study aims to provide a clearer distinction between various non-technological innovation types and a more concise idea of what constitutes each type and where the knowledge that serves as a basis from its development comes from. We examine how domains of knowledge on which the field of non-technological innovation drew from have been changing through time and what prospects current domains of knowledge bring to the stream. To this end, we use a bibliometric quantitative technique called co-citation analysis (White, 2003). Such analytical review enables the identification of the most important contributions and contributors. It also facilitates better completeness of the presentation of a particular scientific field and is more objective. Similar co-citations within the literatures denoting different types of innovation would basically mean that the knowledge informing those research streams comes from similar sources. This implies that the differentiation between them or their cores might be seen as

questionable.

By using authors as the units of analysis and incorporating all the citations that are included in the ISI Web of Science, we trace the evolution of the intellectual structure of the non-technological innovation field during the period 1975 – 2011. We chose a starting point in the year 1975. Two important articles for the development of this field were published this year. First is an ASQ piece by Baldrige and Burnham (1975) 'Organizational Innovation: Individual, Organizational, and Environmental Impacts', where the authors derive on previous individual-level work on innovative behavior to shift this view to include organizational and environmental factors that shape innovation. This study, although not explicitly discussing non-technological innovation, adopts the view of innovative individuals that both complement technological breakthroughs as well as are a form of innovation themselves. This view has been later adopted by management innovation scholars (e.g. Birkinshaw, Hamel, & Mol, 2008).

The second article in 1975 that is relevant to the development of the field is a piece in *Omega* by Utterback and Abernathy (1975). The authors delineate between product and process innovation, allowing for a non-technological aspect of process innovations. This article is influenced more by economics literature and thus comes from the field of technological innovation or innovation in general. However, their view is later adopted by many scholars examining organizational innovation (e.g. Daft, 1978; Kimberly & Evanisko, 1981) that view it as a separated part of technical activities. This resulted in many different typologies, and conceptualizations and empirical studies attempting to capture relations among them and their association with beneficial outcomes, such as technological innovation or organizational performance (e.g. Damanpour & Evan, 1984). Yet a thorough investigation and even conceptualization that would include different proposed types of non-technological innovation activities has been lacking.

To provide a systematic examination of the development of the non-technological innovation field, we delineate the whole period (1975-2011) into four time periods: 1975-1990, 1991-1997, 1998-2004, and 2005-2011. Delineating the whole time stamp into shorter periods is common in co-citation research (e.g. Nerur, Rasheed, & Natarajan, 2008; Fernandez-Alles & Ramos-Rodríguez, 2009). Decision on the number of periods is in the researchers' hands and is related to optimal illustration of the field development. In our case, the beginning period is longer (16 years) than other time frames (7 years each), because the field has grown exponentially and was relatively less active at the beginning. Especially the last couple of years witnessed a rapid growth of this field.

By applying co-citation analysis (a technique that uses co-citations of pairs of authors as the variable that indicates their distances from each other, White & Griffith, 1981; Eom, 2008) in the aforementioned periods, we attempt to identify key areas of research within the non-technological innovation literature and explore where the knowledge base comes from in each of the areas. By using authors as the units of analysis and incorporating all the citations included in the ISI Web of Science, we trace the evolution of the intellectual structure of the non-technological innovation field during the period 1975–2011.

Using pathfinder analysis (a graph-theoretic approach for portraying most important units of analysis and their interrelationships, Nerur et al., 2008) with island algorithm (Batagelj & Mrvar, 1998), we (1) delineate the subfields that constitute the intellectual structure of non-technological innovation and contribute to differentiating between various forms of non-technological innovation; (2) determine the relationships between the subfields; (3) identify authors who play a pivotal role in bridging two or more conceptual domains of research; and (4) graphically map the intellectual structure in two-dimensional space in order to visualize spatial distances between intellectual themes. We contribute to overcoming the ambiguity in the field by clarifying where each topic originates. This provides insight into the content and its origins, and serves as a foundation for a better distinction among various types of non-technological innovation.

By using co-citation analysis, we are able to more objectively single out most important authors and their work and see whether the knowledge comes from the same literatures to studies describing particular types of non-technological innovation. Based on a recent qualitative review article of Damanpour & Aravind (2012), one can assume that non-technological innovation has become mature enough to treat the literature generated by the field as a research topic in its own right. Their study does go into describing different forms of non-technological innovation, but does little to differentiate between them. Furthermore, their review is purely qualitative, whereas we attempt to shed light onto the field using a more subjective and quantifiable approach. Thus, bibliometric methods we use can avoid some of the potential subjective biases and perhaps provide validation to qualitative reviews.

I also want to discuss, compare, and contrast my findings with results of two recent knowledge base explorations by Fagerberg, Fosaas, & Sappasert (2012) and Martin (2012). The authors of the first study examined the whole scientific field of innovation with a different methodology. They focused on

handbooks of that particular field as representative of the most important knowledge and concentrated on works these handbooks cite. Therefore, they only conducted a citation analysis, not a co-citation analysis. Doing so, they drew inferences about the structure of the knowledge base on innovation and analyzed the changing character of the field (Fagerberg et al., 2012). Thus, it provides an interesting basis for comparison of our findings that center on the sub-field of innovation, non-technological innovation, and the whole field. This would enable us to contribute to the field by exploring whether the knowledge base of both fields is any different, has the knowledge come from different theories and research streams, and thus help to further establish differences between non-technological and technological innovation. It also reveals if the field is only growing quantitatively, or is it really contributing content-wise to the field of innovation in general.

Martin (2012), as opposed to Fagerber et al. (2012), did not consult the handbooks to construct the list of most influential authors. He rather applied a snowball technique to identify key authors of the field as well as searched journals for articles using relevant keywords. With the latter, his approach is more similar to mine. However, his findings of the citation analysis may be slightly less representative because his field of interest included both innovation studies and science policy. Nevertheless, as innovation studies do represent most of his field of interest, we also compare our findings with his.

## 2 Types and Forms of Non-Technological Innovation

There are many types of innovation that authors understand within the term non-technological innovation. We first had to do a qualitative literature review to identify these types and forms that would serve as search terms for the co-citation analysis and science mapping. We identified several of them and summarize their authors and definitions in Tables 1 and 2.

**Table 1 A Brief Summary of Definitions of Different Types of Non-Technological Innovation Along with Their Authors (Part 1)**

TERM	AUTHOR	MEANING OR DEFINITION	AUTHORS ADOPTING THIS VIEW
Administrative innovation	Evan (1966)	Technical (new products, processes or services) vs. administrative innovation (new policies)	Daft (1978): administrative innovation = policies of recruitment, allocation of resources, and the structuring of tasks, authority and rewards – <i>organizational level</i> , but content-wise related to administrative practices at lower levels  Kimberly & Evanisko (1981): distinction between technical and administrative innovations is not so much that they serve different functions but that they imply potentially different decision making processes
Organizational innovation	Baldrige & Burnham (1975)	Individual characteristics, such as sex, age, and personal attitudes, administrative positions and roles, structural characteristics of the organization, such as size and complexity, environmental input from the community and other organizations - non-technical process innovations (not non-technical service organizations)	
Organizational innovation	Damanpour & Evan (1984)		Damanpour (1991); Anderson & King (1993); Toterdel et al (2002); Lam (2005); Armbruster et al (2008) - organizational innovation as a change process or as the result of adoption
Administrative innovation	Nutt (1986); Nutt (1989)	The extent to which organizations incorporate and routinely use the following innovations: fresh rules and procedures, changes in roles and structures, and establishment of new relationships	Cooper and Zmud (1990), Kostova (1999) and Klein et al. (2001)  Empirical: Naveh et al (2006) : influence on performance
Organizational, management, and business model innovation	Hamel (1991)	How companies organize, lead, allocate resources, plan, hire, motivate – a holistic view	
Organizational innovation	Nonaka (1994)	A key form of organizational knowledge creation	Damanpour (1996) - innovation as a process of organizational learning and knowledge creation with an emphasis on organizational capacity for change and adaptation; all innovation studies adopting a knowledge-based view
Market innovation	Johne (1998)	As opposed to product and process innovation	
Organizational innovation	Staroboli (1998)	Network as an organizational innovation	Open innovation and supply chain management literature – <i>organizational and economy level</i>
Non-technological process innovation	Papinniemi (1999)	Focused on <i>how</i> (a form of innovation, not a type) – Process innovation = a set of activities to produce output	Krause et al (2007); Li et al (2007); Lambertini & Mantovani (2009)

**Table 2 A brief Summary of Definitions of Different Types of Non-Technological Innovation along With Their Authors (Part 2)**

TERM	AUTHOR	MEANING OR DEFINITION	AUTHORS ADOPTING THIS VIEW
Management innovation	Mol & Birkinshaw (2009)	Organizational structures, management techniques and marketing concepts / strategies - in line with CIS	Vaccaro et al. (2010)
Organizational innovation	Boer & Duing (2001)	organizational vs. process innovation (vs. product innovation) – mixing the innovation form and type typologies	Aunique & Montoro-Sanchez (2010)
Open innovation	Chesbrough (2003, 2006)	The use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively	Open innovation literature (e.g. Chesbrough, 2007, 2010; Vanhaverbeke, Van de Vrande, & Chesbrough, 2008)
Organizational innovation	Sanidas (2004)	Disembodied, not technical	
Strategic innovation	Kodama (2004)	Business process improvement	
Strategic innovation	Filson & Gretz (2004)	Marketing, licensing, adoption / generation	
Business model innovation	Shafer (2005)	Innovation in strategic choices, value network, creating value, and capturing value	
Non-technological innovation	OECD (OSLO Manual, 2005)	Non-technical product and process innovation: organizational (implementation of innovative organizational concepts: structural vs. procedural; intra vs. inter-organizational; business processes or organizational structures) and marketing	Baranano (2003), Wu (2009), Community Innovation Survey (CIS), Mothe & Thi (2010), Schmidt & Kammer (2007)
Technological process innovation	OECD (OSLO Manual, 2005)	Also includes the production organization and/or organizational, financial and commercial activities	Community Innovation Survey (CIS)
Management innovation	Hamel (2006)	What managers are and do	Vaccaro et al. (2012)
Business model innovation	Zott & Amit (2008)	Innovation in the way a company does business, what is its source of competitive advantage, how it transcends traditional firm boundaries	Sosna (2010)
Organizational and managerial innovations	Bodas Freitas (2008)	Quality circles and business process re-engineering	
Business model innovation	Lindgardt et al (2009, BCG)	Innovation in the value proposition (target segments, product or service offerings, revenue model) and the operating model (value chain, cost model, organization)	
Innovation as a process	Barezheh (2009)	Process as a type of innovation (not a procedure or a set of routines – thus a type of innovation, not a form)	
Business model innovation	Teece (2010)	Innovation in five business model elements: capture value, technologies & features, benefit for the customer, target segments, revenue streams)	
Strategic innovation	Afuah (2010)	Strategic management (closely related to business model innovation)	Dozanova (2010)

### 3 Methods

Co-citation analysis is a bibliometric technique that usually uses a matrix of co-citation frequencies between authors as its input (McCain, 1990). This matrix can be the basis for various types of analyses, such as factor analysis, multidimensional scaling, and hierarchical clustering. Instead of conducting all these analyses separately, we follow White's (2003) suggestion and only perform a graph-theoretic approach called Pathfinder analysis in Pajek. This enables us to gain insights into network relationships among authors as well as to identify boundary spanners within each field. Doing so, we can extract key conceptual themes in the non-technological innovation field, show the protagonists of the subfields and the pervasiveness of their influence, as well as finally graphically represent author proximities.

Pathfinder analysis generates a network structure which emphasizes strongest relationships between concepts of interest in the domain (Schvaneveldt, 1990). The nodes in such a network represent the authors, with the co-citation frequency between authors being a measure of their conceptual similarity. The input to Pathfinder analysis is a matrix of raw counts (White, 2003). Such a dataset results in an undirected graph (Nerur et al., 2008). The data were then analyzed with 'island algorithm' in Pajek (Batagelj & Mrvar, 1998), which produced different domains of knowledge for various time segments.

This approach has considerable advantages over traditional author co-citation analysis that uses multiple techniques (e.g. factor analysis, multidimensional scaling, and hierarchical clustering). As Pathfinder networks are generated from matrices of raw counts, such approach removes a computational step associated with traditional co-citation analysis, as well as eliminates the need to use additional

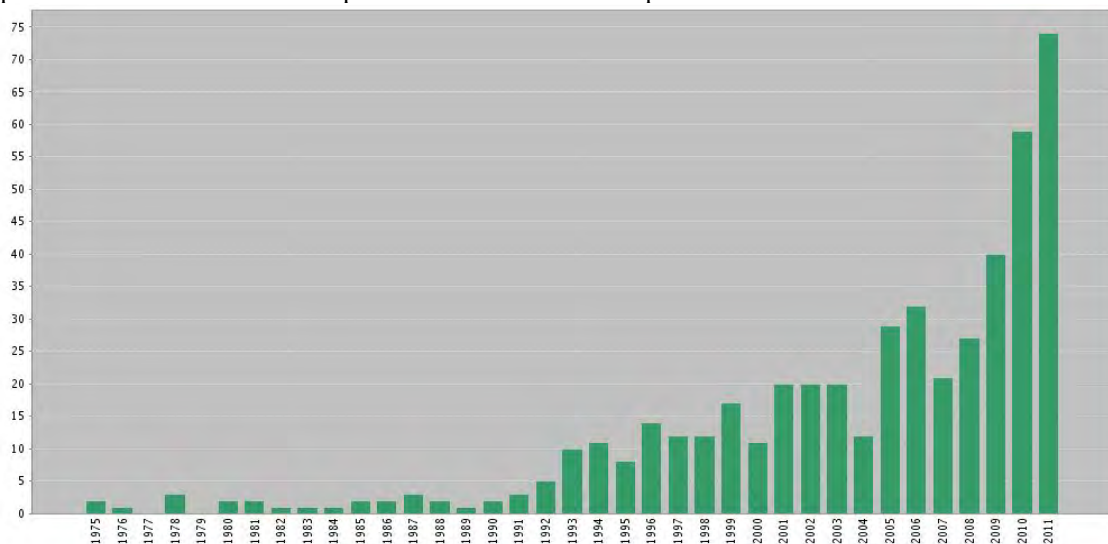
software and apply multiple computer and drawing operations. In Pathfinder networks, nodes represent authors, and particular links represent weighted paths between nodes, with the weights being co-citation counts (White, 2003). The strength of co-citation is defined as the number of times two documents have been cited together. This provides an objective and quantitative way to group or cluster the cited documents (Small & Griffith, 1974). By only including the highest counts for author pairs, only the most salient relationships can be mapped. Dominant authors (e.g. with high degree centrality that are focal to particular disciplines) can be easily identified, as well as those authors that serve as boundary spanners between particular disciplines.

**3.1 Retrieval of co-citation and citation data**

We chose the period 1975-2011 for the examined timeframe. We obtained secondary data through ISI Web of Science, a database used in most bibliometric studies (e.g. White, 2003; Nerur et al., 2008). We searched the database using the search term ‘OR’. The following keywords were used: ‘non-technological innovation’, ‘non-technical innovation’, ‘management innovation’, ‘marketing innovation’, ‘organizational innovation’, ‘strategic innovation’, ‘business model innovation’, ‘administrative innovation’, ‘open innovation’, ‘green innovation’, and ‘ancillary innovation’.

The search was refined by key areas (Web of Science Categories): MANAGEMENT or BUSINESS or PSYCHOLOGY EDUCATIONAL or PSYCHOLOGY EXPERIMENTAL or OPERATIONS RESEARCH MANAGEMENT SCIENCE or PUBLIC ADMINISTRATION or BUSINESS FINANCE or ECONOMICS or PSYCHOLOGY APPLIED or SOCIOLOGY or INDUSTRIAL RELATIONS & LABOR or SOCIAL WORK or PSYCHOLOGY or PSYCHOLOGY SOCIAL or PSYCHOLOGY MULTIDISCIPLINARY or SOCIAL SCIENCES INTERDISCIPLINARY. We searched in all three databases offered by ISI: SCI-EXPANDED (Science Citation Index Expanded), SSCI (Social Sciences Citation Index), and A&HCI (Arts & Humanities Citation Index).

From this search, we got a database containing 538 units of literature. After that, we manually reviewed the abstracts and excluded the articles that weren’t relevant for my topic, even if they passed the first filtering by keywords. Doing so, we reduced the number of articles to 482 units. The sample or primary articles (citations of these primary articles are used in the analyses) thus includes 482 articles from the ISI Web of Knowledge from the 1975-2011 period that fit the keywords relevant for non-technological innovation field. They cited 11,036 papers (average citations per article: 31.90). In turn, they were later cited by others 15,375 times. Figure 1 demonstrates how the primary articles were published in terms of the actual publication dates within the period.



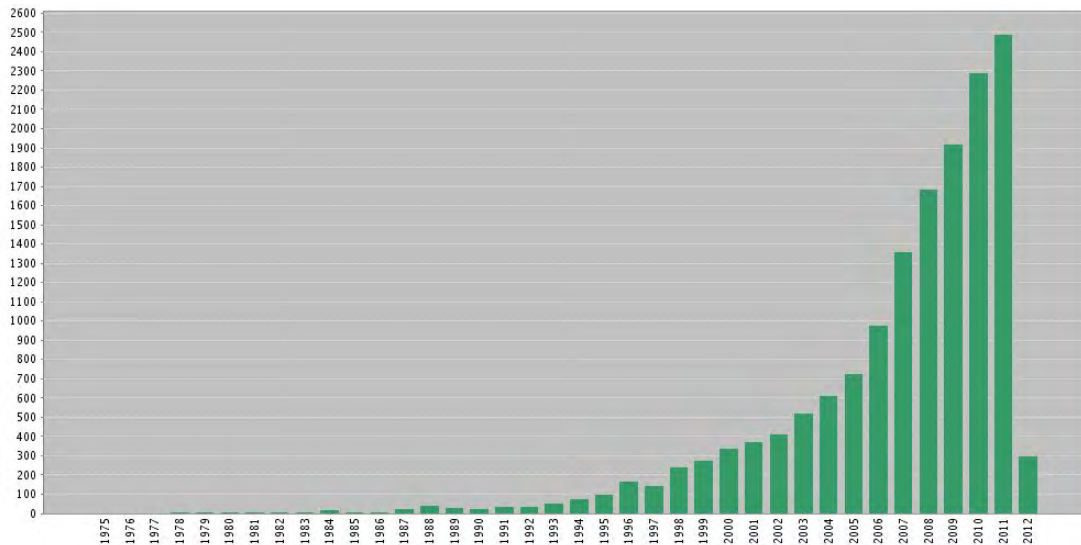
**Figure 1 Distribution of the Primary Articles Within the Years in 1975-2011**

Source: ISI Web of Knowledge.

As attested by Figure 1, a relatively low amount of papers were published in the earlier years of the 1975-2011 period. This is characteristic for many fields, but an exponential growth is even more present on the field of non-technological innovation. Figure 2 reveals when these primary articles were then later cited and times they were cited, indicating their influence in general. Table 3 reveals primary articles that were cited the most. In terms of the co-citation analysis, not primary articles, but target articles are



important (that are referred to in the primary articles). We obtained these through the cited references search.



**Figure 2 Date of Primary Articles' Citations**

Source: ISI Web of Knowledge.

We exported the database of target articles into Bibexcel (Persson, Danell, & Schneider, 2009). Because a large number of references usually have to be handled in the co-citation analysis, there must be a cutoff point, or citation threshold, which is applied to the references that exceed a preset number of citations (Eom, 2008; Fernandez-Alles & Ramos-Rodríguez, 2009). We applied different thresholds in each time stamp to provide as insightful presentation of the field and its origins at each period as possible. We used Bibexcel for counting frequencies and co-occurrences, and generating the raw co-citation matrix.

**Table 3 Highest Cited Primary Articles**

Title	Authors	Source Title	Year	Citations	Citations per Year
A dynamic theory of organizational knowledge creation	Nonaka, I	Organization Science	1994	2190	115.26
Organizational innovation - a meta-analysis of effects of determinants and moderators	Damanpour, F	Academy Of Management Journal	1991	1004	45.64
Assessing the work environment for creativity	Amabile, TM; Conti, R; Coon, H; Lazenby, J; Herron, M	Academy Of Management Journal	1996	548	32.24
Organizational innovation - the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations	Kimberly, JR; Evanisko, MJ	Academy Of Management Journal	1981	522	16.31
Toward a theory of organizational creativity	Woodman, RW; Sawyer, JE; Griffin, RW	Academy Of Management Review	1993	476	23.80
Bridging epistemologies: The generative dance between organizational knowledge and organizational knowing	Cook, SDN; Brown, JS	Organization Science	1999	403	28.79
Institutional and competitive bandwagons - using mathematical-modeling as a tool to explore innovation diffusion	Abrahamson, E; Rosenkopf, L	Academy Of Management Review	1993	260	13.00
Entrepreneurship in the large corporation: A longitudinal study of how established firms create breakthrough inventions	Ahuja, G; Lampert, CM	Strategic Management Journal	2001	249	20.75
Disrupted routines: Team learning and new technology implementation in hospitals	Edmondson, AC; Bohmer, RM; Pisano, GP	Administrative Science Quarterly	2001	247	20.58
Aging, obsolescence, and organizational innovation	Sorensen, JB; Stuart, TE	Administrative Science Quarterly	2000	242	18.62

Source: ISI Web of Knowledge.

We first present some descriptive statistics characteristic for the whole period 1975-2011. Focusing on citations, Table 4 reveals articles that were cited the most from the target articles (that were in the references of the primary articles). The article by Damanpour (1991) was the most often cited piece, cited 140 times in all 482 articles that constitute the database of primary articles.



**Table 4 Target Articles with Highest Citation Frequencies (1975-2011)**

Citation frequency	First author, year, and publication
140	Damanpour F, 1991, V34, P555, Acad Manage J
105	Kimberly J, 1981, V24, P689, Acad Manage J
67	Daft R, 1978, V21, P193, Acad Manage J
60	Rogers E, 1983, Diffusion Innovation
60	Zaltman G, 1973, Innovations Org
54	Cohen W, 1990, V35, P128, Admin Sci Quart
48	Damanpour F, 1984, V29, P392, Admin Sci Quart
44	Downs G, 1976, V21, P700, Admin Sci Quart
43	Rogers E, 1995, Diffusion Innovation
41	Wolfe R, 1994, V31, P405, J Manage Stud
40	Dewar R, 1986, V32, P1422, Manage Sci
39	Damanpour F, 1987, V13, P675, J Manage
37	Meyer A, 1988, V31, P897, Acad Manage J
36	Burns T, 1961, Management Innovatio
36	Tushman M, 1986, V31, P439, Admin Sci Quart
36	Dimaggio P, 1983, V48, P147, Am Sociol Rev
34	Vandeven A, 1986, V32, P590, Manage Sci
34	Barney J, 1991, V17, P99, J Manage
33	Nonaka I, 1995, Knowledge Creating C
32	Aiken M, 1971, V5, P63, Sociology
31	Nunnally J, 1978, Psychometric Theory
31	Schumpeter J, 1934, Theory Ec Dev
30	Nelson R, 1982, Evolutionary Theory
30	Baldrige J, 1975, V20, P165, Admin Sci Quart

Table 5 reveals the articles that were most often cited together (co-occurrences). This is the basis for co-citation analysis and later on pathfinder analysis. Articles by Daft (1978) and Kimberly and Evanisko (1981) were most often cited together by the 482 primary articles – 34 times.

**Table 5 Target Articles with Highest Co-Citation Frequencies (1975-2011)**

Co-occurrence frequency	Cited reference 1 (First author, year, and publication)	Cited reference 2 (First author, year, and publication)
34	Daft RL, 1978, Acad Manage J	Kimberly JR, 1981, Acad Manage J
33	Kimberly JR, 1981, Acad Manage J	Zaltman G, 1973, Innovations Org
29	Kimberly JR, 1981, Acad Manage J	Rogers EM, 1983, Diffusion Innovation
27	Kimberly JR, 1981, Acad Manage J	Meyer AD, 1988, Acad Manage J
26	Dewar RD, 1986, Manage Sci	Kimberly JR, 1981, Acad Manage J
26	Rogers EM, 1983, Diffusion Innovation	Zaltman G, 1973, Innovations Org
25	Damanpour F, 1987, J Manage	Kimberly JR, 1981, Acad Manage J
24	Daft RL, 1978, Acad Manage J	Zaltman G, 1973, Innovations Org
23	Daft RL, 1978, Acad Manage J	Damanpour F, 1984, ASQ
22	Downs GW, 1976, ASQ	Kimberly JR, 1981, Acad Manage J
22	Daft RL, 1978, Acad Manage J	Rogers Em, 1983, Diffusion Innovation
22	Damanpour F, 1984, ASQ	Kimberly JR, 1981, Acad Manage J
21	Downs GW, 1976, ASQ	Zaltman G, 1973, Innovations Org
20	Aiken M, 1971, Sociology	Kimberly JR, 1981, Acad Manage J
20	Damanpour F, 1984, ASQ	Rogers EM, 1983, Diffusion Innovation
20	Baldrige JV, 1975, ASQ	Kimberly JR, 1981, Acad Manage J

#### 4 Co-citation analysis results

To facilitate visualization of data and improve interpretation of results we segmented the 1975-2011

period into four segments. We created four separate files in Bibexcel that we could transfer to Pajek, where we could visualize the network using social network analysis with Kamada-Kawai algorithm. The data were then analyzed with 'island algorithm' in Pajek (Batagelj & Mrvar, 1998), which produced different domains of knowledge for various time segments using line weights. We then compare results of analyses with other quantitative reviews of the field of innovation in general (e.g. Fagerberg et al., 2012; Martin, 2012).

Following the procedure outlined above, a frequency of co-citations was obtained for each pair of authors. We used objective modeling procedure without subjective weighting of authors or studies. For each period of analysis, only authors who had a threshold of co-citations that was designed for each period separately were retained for analysis. It must be noted that not all target authors appear in all the time periods analyzed.

Island algorithm enables to only look at the tops of the clusters formed by target co-citation articles. This is provided by choosing a number of bottom and top components using line weights. We decided to use an approach that looks at all the tops, even if they had different altitude. There is a content-wise argument for this decision; otherwise there would be too much organizational innovation that actually denotes innovation in organizations - technological included - within the database. This way, we were able to better differentiate between various forms of innovation. We portray and interpret results for each of the smaller periods separately for better illustration and then altogether for the whole period 1975-2011.

#### **4.1 First interval (1975-1990)**

Focusing on citations, we first identified articles that were cited the most from the target articles (that were in the references of the primary articles during 1975-1990). By identifying most frequently cited studies, we would be able to identify key topics of research within the discipline in each period. The book by Rogers and Shoemaker (1971) 'Communication of Innovations; A Cross-Cultural Approach' was the most often cited piece, cited 6 times by the primary articles in 1975-1990). We then focused on articles that were most often cited together (co-occurrences). Articles by Baldrige and Burnham (1975) and Mohr (1969) were most often cited together by the primary articles in 1975-1990 – 5 times. The same is true for a co-occurrence of March and Simon (1958), and Sapolsky (1967) and Rogers and Shoemaker (1971), respectively.

To portray a network of co-citations for the first period, we chose a cutoff point of at least three co-citations in the first stage. This resulted in two graphs. The first one (Figure 3) reveals all islands. This period comprises the fewest authors of all periods. It consists of four clusters. We then removed the first (largest) island so the graph (Figure 4) only portrays the most important authors and the relationships among them. Unit (circle) sizes reflect the number of links they hold. Three islands remain, and are very well connected with each other without any authors serving as particular boundary-spanners. Analysis of the first co-citation network reveals theoretical foundations on which the non-technological innovation discipline has been built. It is obvious that the works of Baldrige and Burnham (1975) and Rogers and Shoemakers (1971) are central to the network. These studies are apparently the most important for the development of the non-technological innovation field in the first examined period. Both studies (that are in separate clusters) are also connected with both two other clusters.

The ASQ piece by Baldrige and Burnham (1975) seems to be the first to argue that research on innovation diffusion should shift from individuals to organizational structure and environmental factors. Examining innovative behavior at the individual level, they found that personal characteristics do not seem to be as important in complex organizations as administrative and structural factors and even environmental input from the community and other organizations.

Besides this study, the first cluster (that is actually a dyad – market with red circles in Figure 2.4) also includes a study by Mohr (1969). As this article also deals with antecedents of innovation, we label this cluster 'determinants of innovation'. What is interesting, however, is that both of these studies derive from individual-level factors for innovation and draw a lot from, especially Baldrige and Burnham (1975), psychology. This indicates that individual-level innovation research has been of great importance for the development of the non-technological innovation field.

The second cluster (green circles) is labeled 'organization studies'. It is in fact a triplet of Rogers and Shoemakers (1971), Sapolsky (1967), and March and Simon (1958). These studies deal with organizational-level factors and the dynamics of problem solving and consequently innovation, but also with diffusion of innovation within the social system of an organization.

The third cluster (a dyad denoted by yellow circles) is labeled 'industrial economics'. It includes two studies: Mansfield (1968), and Galbraith and Nathanson (1978). Their approach is related to the

perspective of evolutionary economics and is more focused at the level of an industry, with organizations being considered as the ‘black box’. This cluster indicates an important discipline that was even more salient for innovation research in general, but has also influenced the field of non-technological innovation. However, this influence was less strong than the influence of organization studies or individual-level innovation research.

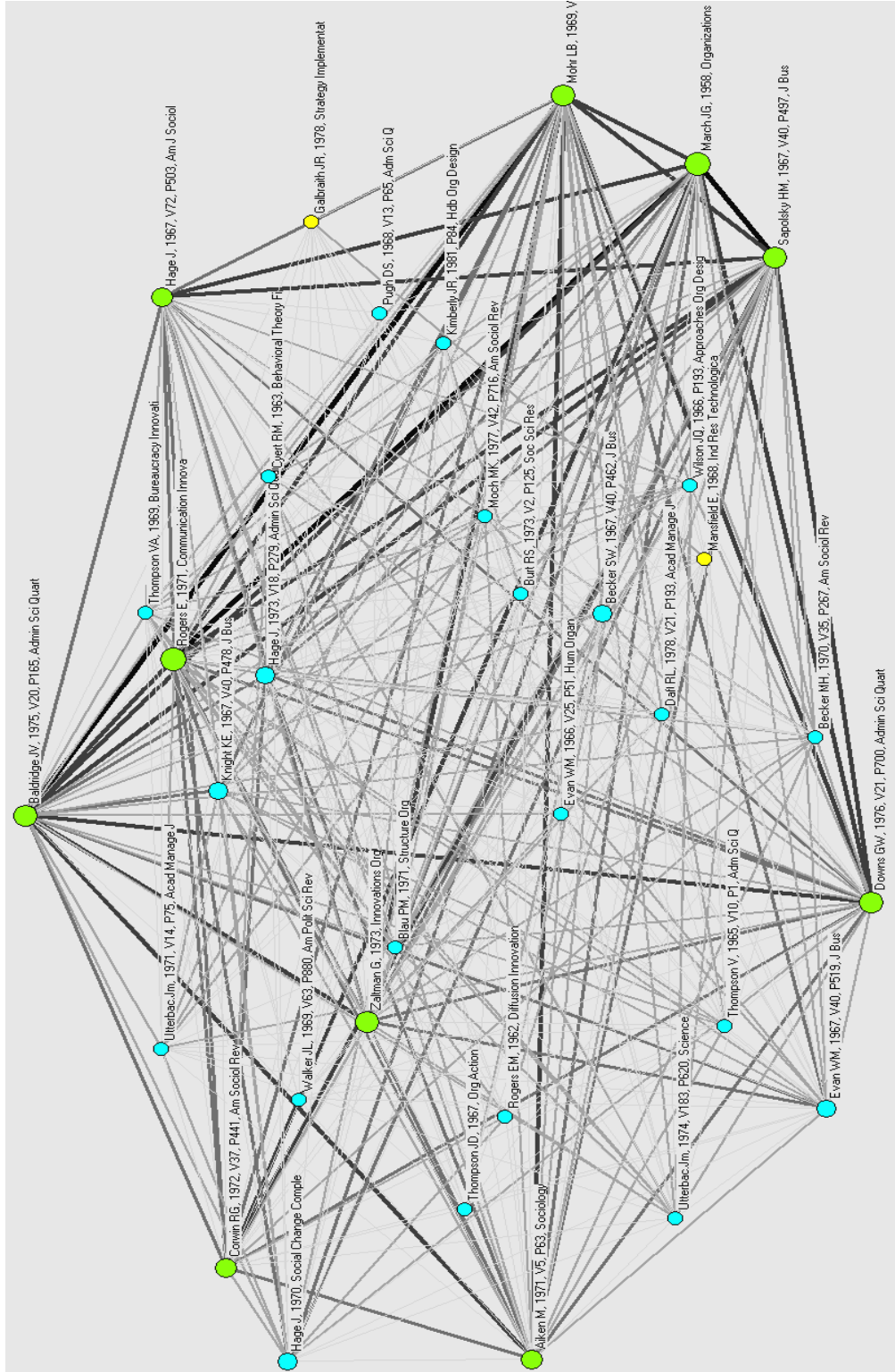


Figure 3 Co-citation Network (1975-190) – All Islands, Cutoff = 3 Co-Citations

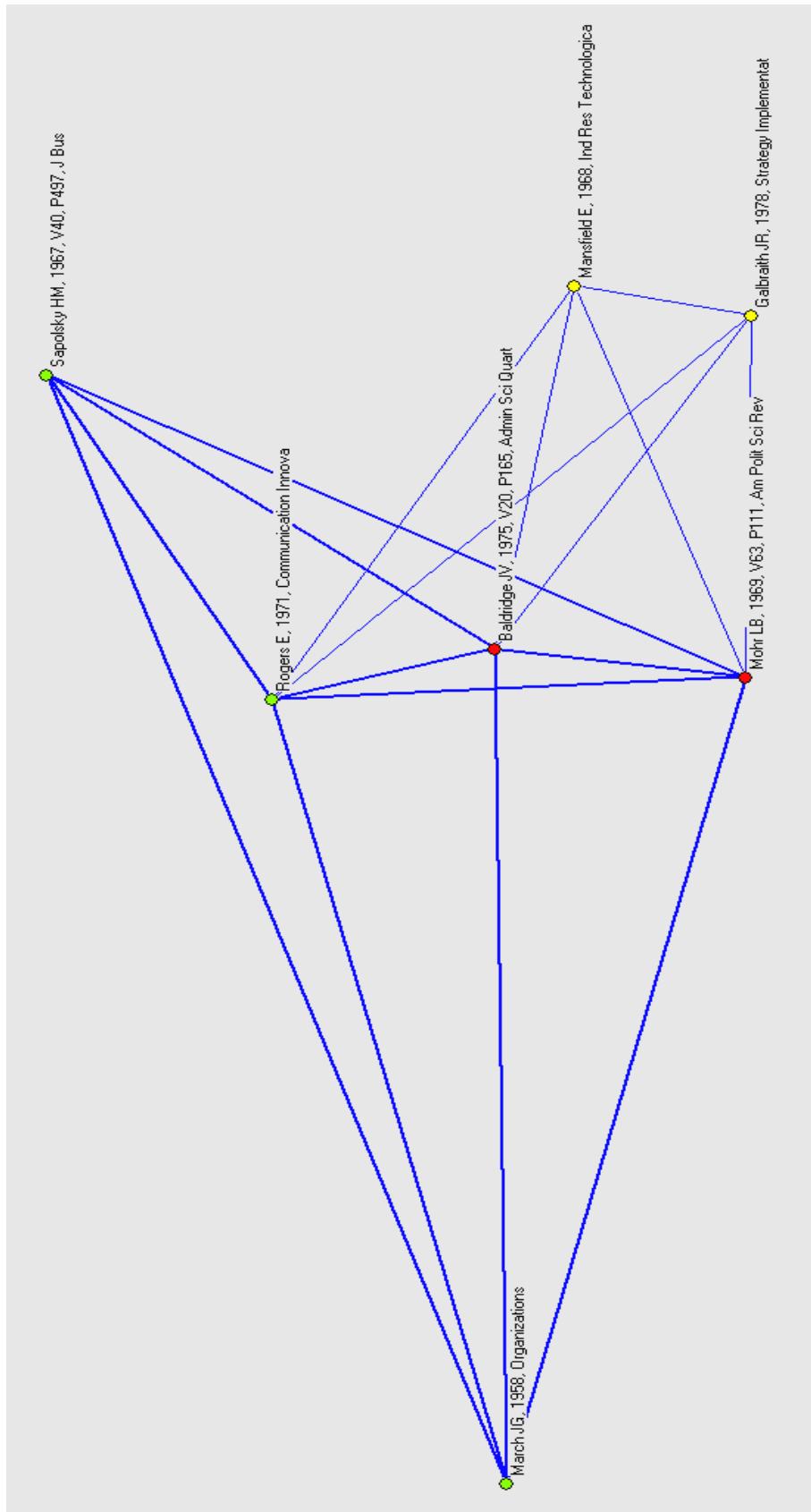


Figure 4 Co-citation Network (1975-1990) – Without the First Island, Cutoff = 3 Co-citations



### 4.2 Second interval (1991-1997)

The book by Rogers (1983) was the most often cited piece in this period, cited 24 times in primary articles during 1991-1997, followed by the article of Kimberly and Evanisko (1981) that was cited 23 times. Article by Kimberly and Evanisko (1981) was the most often cited together with the book by Zaltman et al. (1973) by the primary articles in 1991-1997– 14 times. An overview of size and composition of the research network arising from co-citation relations among the most cited authors in the period 1991-1997 reveals only one large cluster. This indicates that the field of non-technological innovation in this period was very well connected – authors (co-) cited very similar studies.

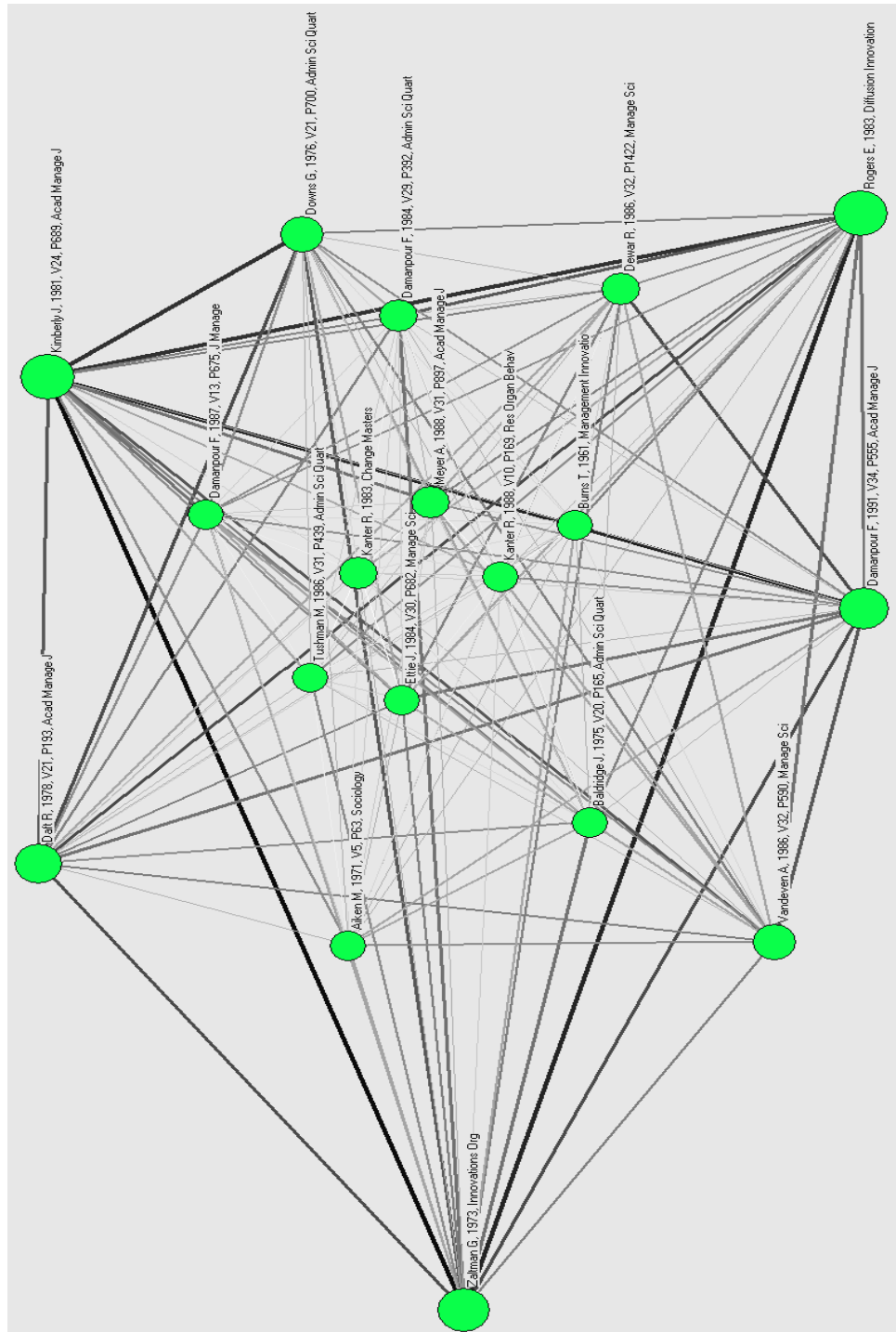


Figure 5 Co-Citation Network (1991-1997), Cutoff = 10 Co-Citations

A very influential work of Baldrige and Burnham (1975) is the only one from the previous era remains in the network with a milder threshold (Figure 5). A network with a stricter citation threshold (Figure 6), however, reveals that none of the influential works in the first period was among the most important ones in the second period. Moreover, we can observe a large influx of works based on organizational studies that emerge in this period and are apparently very influential for the development of the field in the second period. This is the period that organizational innovation effectively became a discipline of its own. The most notable studies in this component from the organization studies of innovation discipline that emerge in the field of non-technological innovation are articles by Damanpour and Evan (1984), and Downs Jr and Mohr (1976) in ASQ, by Kimberly and Evanisko (1981) and Damanpour (1991) in AMJ, and by Dewar and Dutton (1986), and Van de Ven (1986) in Management Science. These studies were crucially affected by Daft's (1978) work on dual-core model of innovation (administrative and technical, which is actually based on Evan, 1966), Zaltman et al.'s (1973) book on innovation in organizations, and Rogers' (1983) new book on diffusion of innovations.

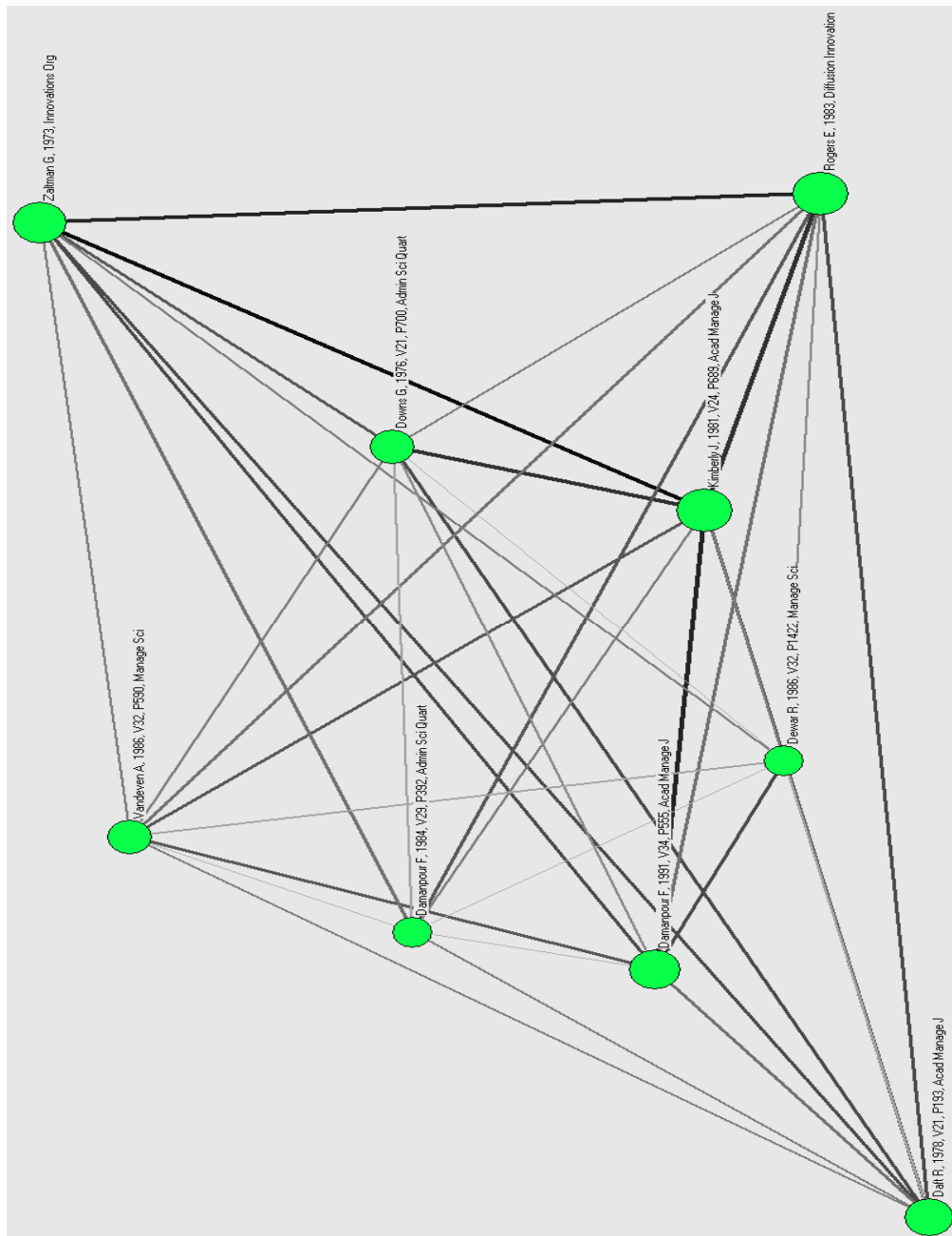
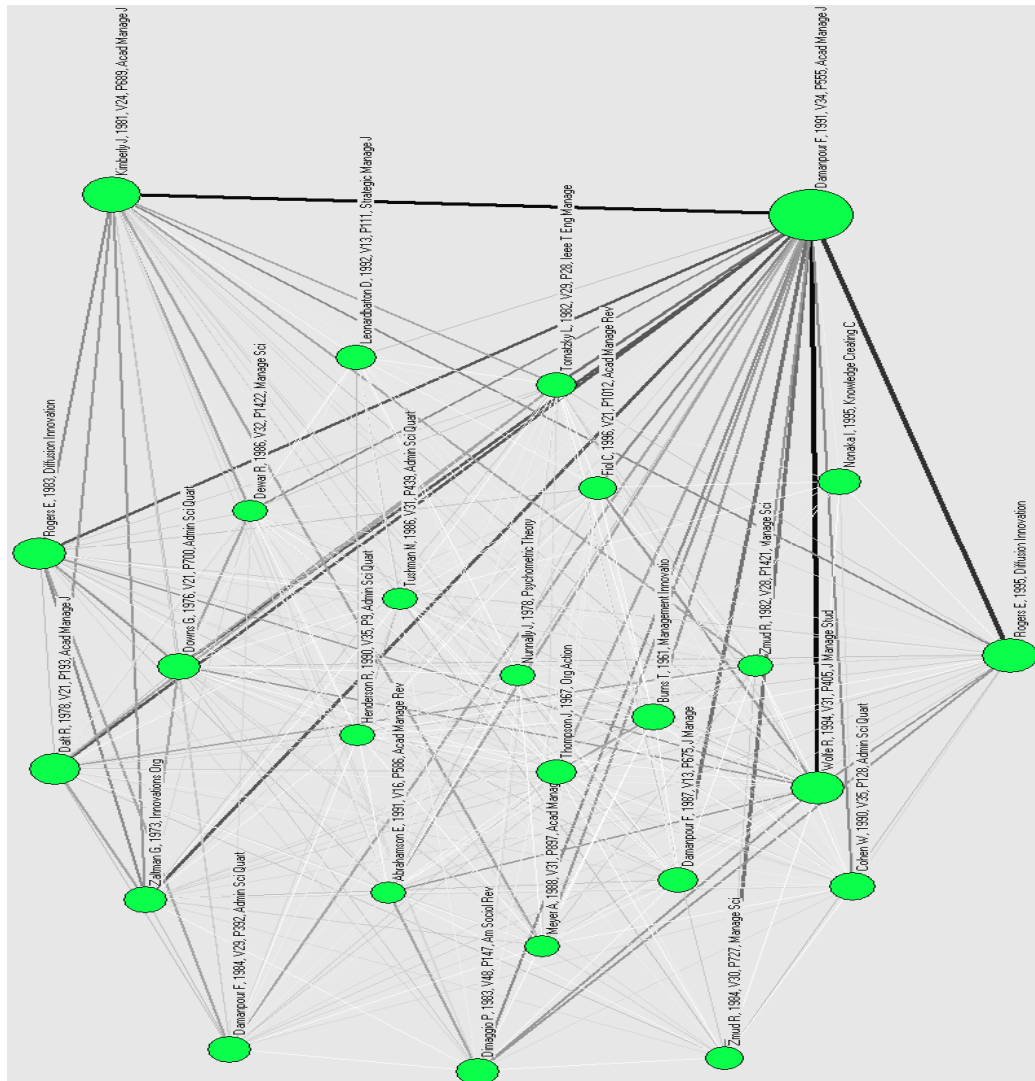


Figure 6 Co-Citation Network (1991-1997), Cutoff = 12 Co-Citations

From this evidence, we can conclude that organizational studies became a predominant research stream driving new research on the field of non-technological innovation during 1991-1997, overtaking individual-based innovation research. It is not arguable that industrial economics did influence the field of organization studies. However, industrial economics did not seem to have a major direct influence on the field of non-technological innovation. Another important lesson learnt from this analysis is related to labeling of non-technological innovation. It is in this period that a clear distinction was made apparent by Daft (1978) between administrative (non-technological) and technical (technological) innovation. However, authors following in his footsteps confusingly use the notion of organizational innovation both to denote innovation in organizations as well as to label only non-technological forms of innovation. Thus, the delineation, even if it was first made very explicit by Daft (1978), did not hold for long as perplexity regarding labeling soon started to ooze into the field.

**4.3 Third interval (1998-2004)**

The article by Damanpour (1991) was by far the most often cited piece, cited 43 times in primary articles during 1998-2004, followed by Kimberly and Evanisko (1981). Damanpour (1991) conducted a meta-analysis of the relationships between organizational innovation and its determinants, including technical knowledge resources. In one of the earliest works to contain the term 'organizational innovation' in its title, Kimberly and Evanisko (1981) analyzed the influence of individual, organizational and contextual factors on hospitals' adoption of technological and administrative innovations. To no surprise, the first two articles that were most often cited together (co-occurrences) in primary articles during 1998-2004 are linkages with Damanpour's (1991) meta-analysis on organizational innovation: an aforementioned piece by Kimberly and Evanisko (1981) and a review on organizational innovation by Wolfe (1994) in JMS.



**Figure 7 Co-Citation Network (1998-2004), Cutoff = 8 Co-Citations**

Co-citation networks (Figures 7 and 8) again only reveal one cluster. The network of the period 1998-2004 is quite similar to the one from the previous period. Like before, organization studies is the main domain of knowledge where organizational innovation studies that are still predominant on the field of non-technological innovation during 1998-2004 draw their knowledge.

Even though the main domain of knowledge remains very dense, connected, and coherent, we can see three interesting influxes to this homogenous cluster. One is the appearance of sociological studies that see DiMaggio and Powell's (1983) article as being one of the most influential in this era (Figure 8). Another is the occurrence of an earlier study on management of innovation (Burns & Stalker, 1961), which indicates a future development of management innovation that is popular now. Connected to these are studies on knowledge and learning (Nonaka, 1991) and absorptive capacity (Cohen & Levinthal, 1990) that together indicate a different approach again more based on people, their knowledge and skills, and the relationships among them.

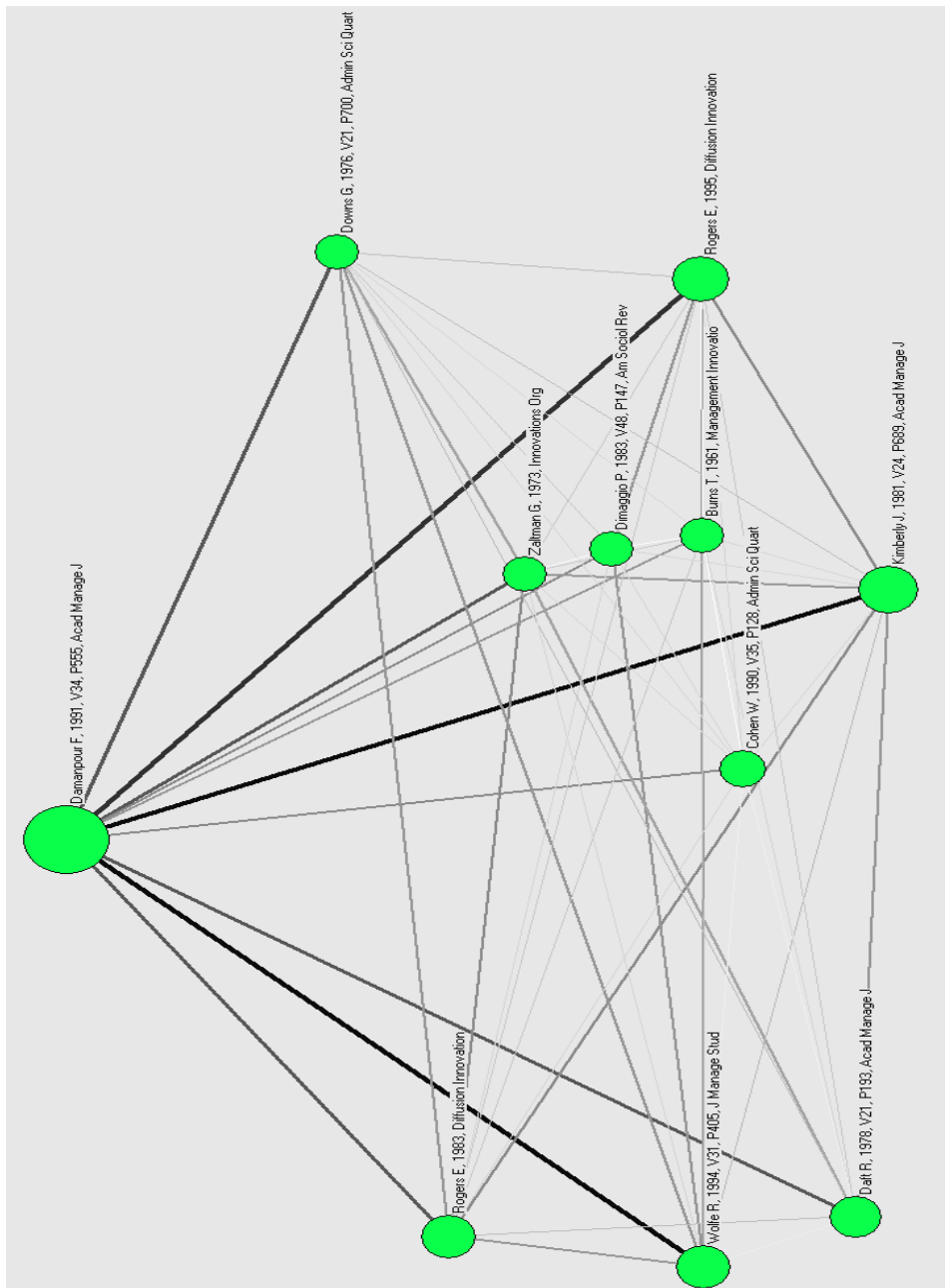


Figure 8 Co-Citation Network (1998-2004), Cutoff = 12 Co-Citations



Therefore, the period 1998-2004 has seen an important decline from using merely organizational studies as the knowledge basis. Studies on non-technological innovation in this era have started to draw from sociology and resource-dependence theory, particularly organizational learning and absorptive capacity. Other than that, as mentioned, organizational studies still dominate this field. It also has to be again pointed out that all these studies were all frequently cited together, which means they do not represent separate clusters, but one well connected network.

#### **4.4 Fourth interval (2005-2011)**

As in the previous period, the article by Damanpour (1991) was by far the most often cited piece in this period, referenced to 80 times in the primary articles during 2005-2011. Again, first two co-occurrences are connections with the highest cited article by Damanpour (1991) – Kimberly and Evanisko (1981) and Daft (1978).

Figures 9 (citation threshold at 20) and 10 (citation threshold at 20, without the first island and with different islands marked) reveal the co-citation networks of the final period. Compared with previous networks, there are more authors and clusters in this era, in line with the general growth of the non-technological innovation research activity. There is also quite a lot of fluctuation, which indicates the research dynamic that was in play during this time period. Figure 10 in particular reveals the main knowledge domains that influenced the research fronts within the field of non-technological innovation during 2005-2011. We also summarize these components in Table 6.

The first component is an extension of the most influential studies in the previous period and is thus labeled 'organizational innovation'. Organizational studies thus had a steady impact on non-technological innovation and still appear to be central to the network. This cluster includes studies such as Daft, 1978; Damanpour, 1991; Kimberly & Evanisko, 1981; and Wolfe, 1994, but also a piece by Cohen and Levinthal (1990) on absorptive capacity, indicating this learning perspective has become embodied within the mainstream of the non-technological innovation field. There is also another interesting study dealing with research on organizational creativity (Amabile, Conti, Coon, Lazenby, & Herron, 1996) that serves as evidence for the importance of creativity research based on psychology for the field of non-technological innovation. It is in this period that the fields of creativity and innovation became more tightly connected.

There are three components (dyads) that appear to be very central to the co-citation network. The second component can be labeled as 'group decision-making and creativity' and includes two studies published in *Applied Psychology* (Tjosvold, 1998; West, 2002). The authors deal with conflict and group decision-making for creativity and goal achievement. These studies draw a lot from psychology, indicating an intertwining between the field of non-technological innovation and individual-level psychology work on creativity, which became apparent in this period.

The third component has a lot in common with the previous one and is termed 'creativity at work'. It includes Woodman et al.'s (1993) AMR conceptualization of organizational creativity and Oldham and Cummings' (1996) AMJ study on personal and contextual factors of creativity at work. The fourth component comprises studies of more methodological orientation, more specifically, it consists of two pieces on case study research (e.g., Eisenhardt, 1989).

There are five more components in the network, all of them more on the edge of the network with weaker linkages with the more homogenous cluster and with no direct linkages among them; one of them is even not connected to other components at all. Component number five consists of two studies and is termed 'innovation and entrepreneurship'. It deals with creating new businesses on the basis of creating something new (e.g. Garud & Karnę, 2003). It is connected both with creativity literature and with organizational innovation research. Component number six consists of a triplet of studies published in the *Journal of Marketing* (e.g. Narver & Slater, 1990) and is labeled 'marketing innovation'. This component is much more loosely linked to other studies in the network; there are some connections through the methodological component, as well as with some of the earlier work on organizational innovation (e.g. Kimberly & Evanisko, 1981). Other components deal with cost and performance management, creativity and innovation in organizations, and human resource management.

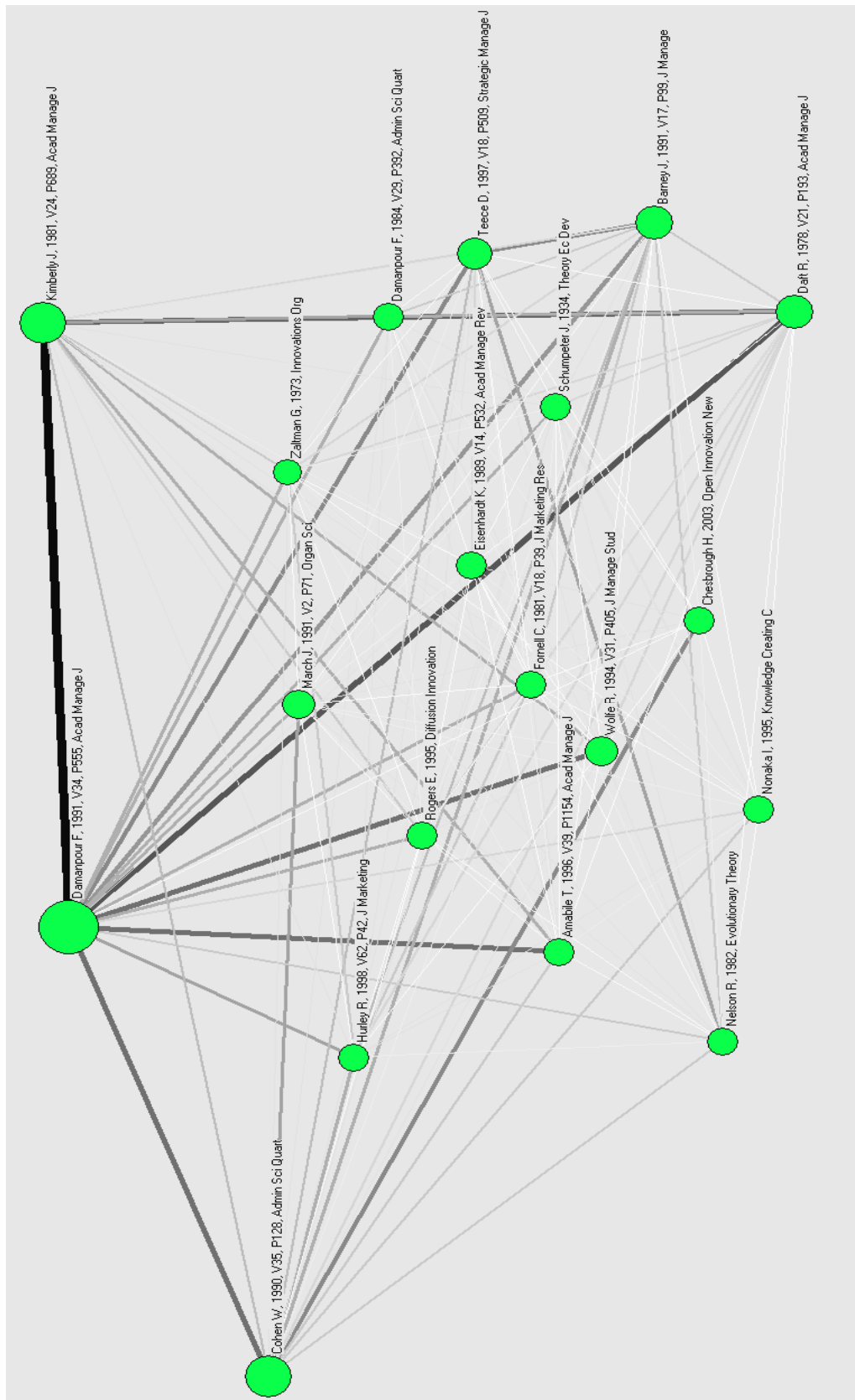


Figure 9 Co-Citation Network (2005-2011), Cutoff = 20 Co-Citations

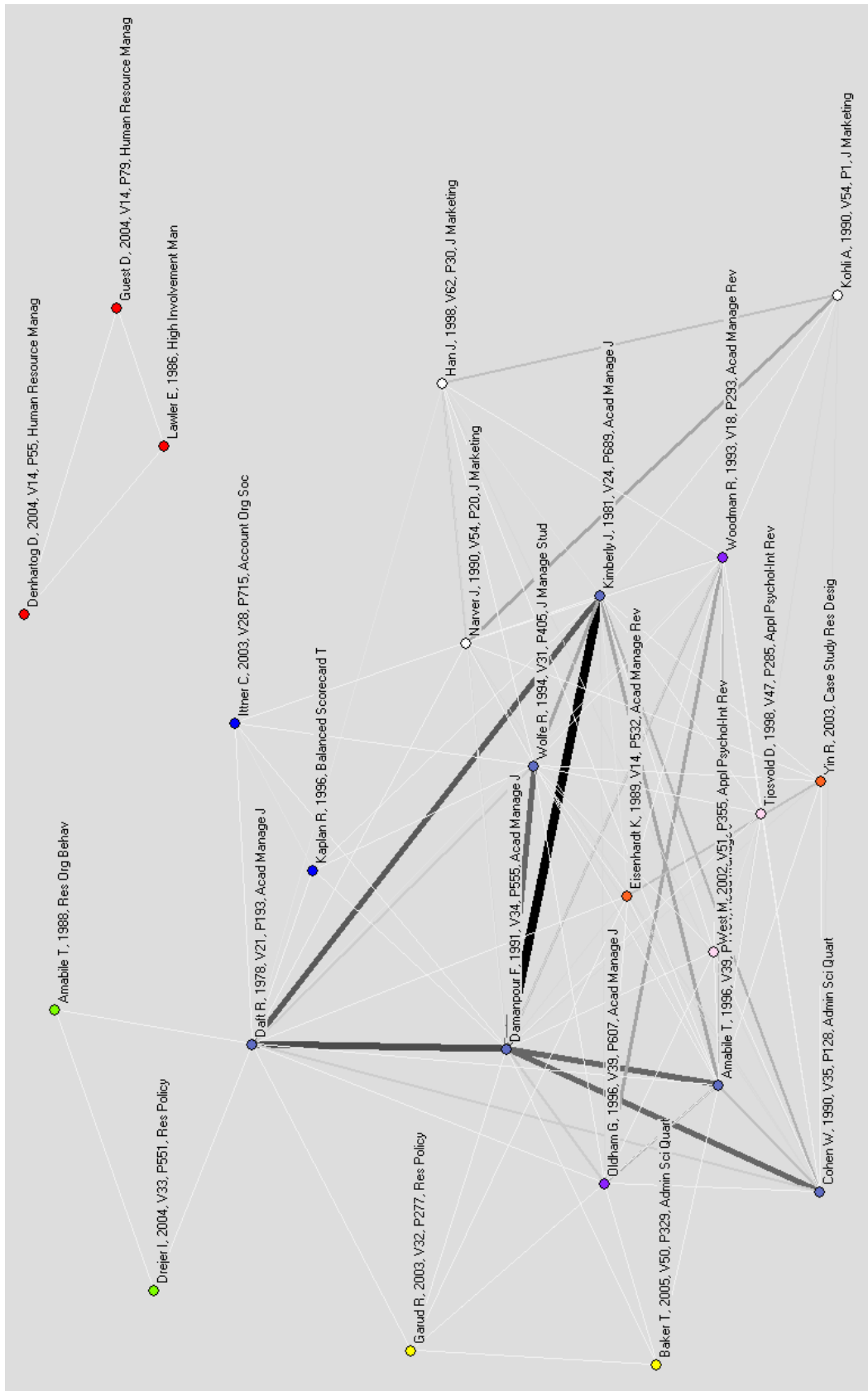


Figure 10 Co-Citation Network (2005-2011) – Without the First Island, Cutoff = 20 Co-Citations

**Table 6 Components of the Co-Citation Network (2005-2011)**

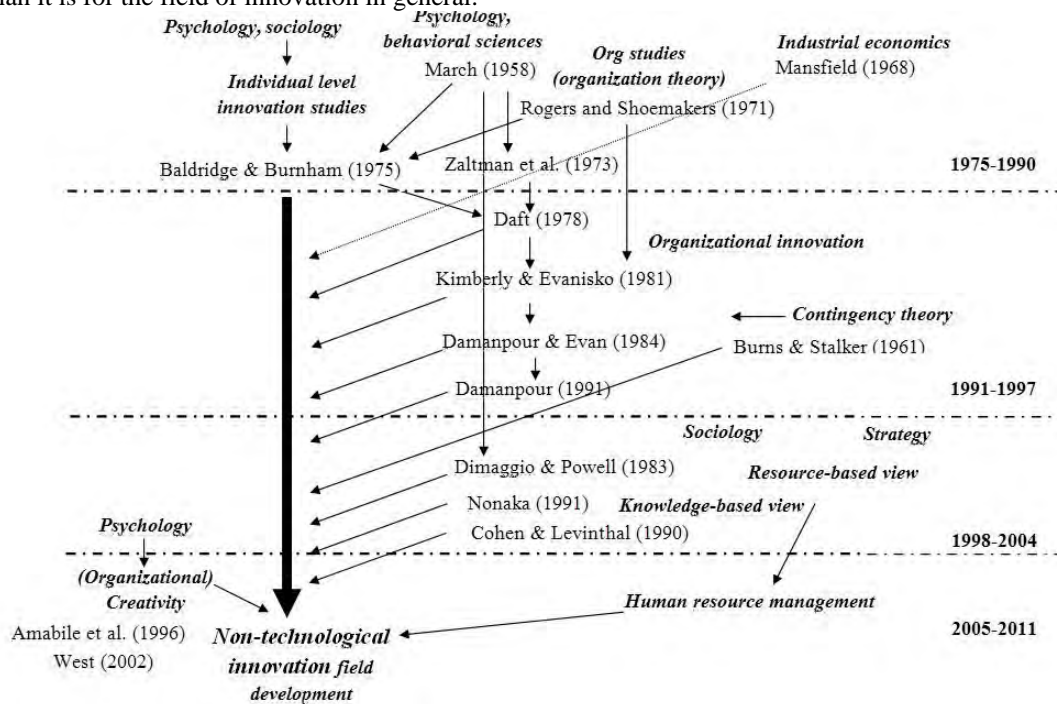
Component # and label	Color (Figure 10)	Characteristic authors	Content
1) Organizational innovation	Light blue	Daft, 1978; Damanpour, 1991; Kimberly & Evanisko, 1981; and Wolfe, 1994	Organizational studies, absorptive capacity, creativity
2) Group decision-making and creativity	Light pink	Tjosvold, 1998; West, 2002	Conflict and group decision-making for creativity and goal achievement
3) Creativity at work	Purple	Woodman et al.'s (1993) AMR conceptualization of organizational creativity and Oldham and Cummings' (1996)	Organizational creativity, personal and contextual factors of creativity
4) Case study research	Orange	Eisenhardt, 1989; Yin, 2003	Methodological orientation
5) Innovation and entrepreneurship	Yellow	Garud & Kamre, 2003; Baker & Nelson, 2005	Creating new businesses on the basis of creating something new
6) Marketing innovation	White	Narver & Slater, 1990	Marketing innovation
7) Cost and performance management	Dark blue	Kaplan & Norton, 1996; Ittner, Larcker, & Randall, 2003	Balanced scorecard as an example of organizational, administrative, or managerial innovation
8) Organizational innovation modeling	Green	Amabile, 1988; Drejer, 2004	Creativity and innovation in organizations, service innovation
9) Human resource management	Red	Den Hartog & Verburg, 2004	The importance of high-performance work systems, organizational culture, job design, and other HRM practices for innovation

The period 2005-2011 presented a more differentiated structure with plenty of new lines of research that influenced the field of non-technological innovation. There are many new authors, with only the most important authors from the previous cluster appeared again (e.g. Daft, 1978; Damanpour, 1991; Kimberly & Evanisko, 1981). Because of this heterogeneity, it comes as no surprise that the components constituting the network are a lot less connected to each other than in the previous time frames. This provides an opportunity to observe brokerage of particular studies.

Figure 10 demonstrated the network diagram for the set of authors that were co-cited in the period 2005-2011. In addition to emphasizing the most critical paths between authors, the figure also helps us to discern authors who play a pivotal role in bridging otherwise separate components. Three pieces in particular, which are all nodes constituting the first component (Daft, 1978; Kimberly & Evanisko, 1981; Damanpour, 1991) are critical to the stability of this network of authors because they are central nodes that connect distinct clusters. These studies are not only central to the network, but also act as brokers (Burt, 2007) and serve as bridges between distinct subgroups or sub-disciplines. Based on this evidence, we can conclude that the most influential investigations in the area of non-technological innovation have been related to organizational innovation, and other subfields are tightly connected to this research.

Figure 11 summarizes the development of the field presented before and illustrates where the knowledge came from (in terms of other disciplines) to the field of non-technological innovation, through which studies and authors, and during which period. What is important is that individual-level innovation studies and organizational creativity studies are relatively unconnected. Even if both provided the field of non-technological innovation with important insights from individual-level psychology studies, it is important to note that these were relatively unconnected. Also, even if it is common belief that creativity is the discipline that was the first to provide innovation studies an individual level based perspective, there are other individual-level based studies that had an impact first. Besides, the importance of these individual-level innovation studies is much more important for the field of non-technological innovation

than it is for the field of innovation in general.



**Figure 11 An Illustrative Simplification of the Knowledge Emergence for the Field of Non-Technological Innovation**

**4.5 Total period (1975-2011)**

Comparisons across the four periods revealed some interesting patterns about how the domains that influenced the intellectual structure of the field have evolved. Now we focus on the whole timeframe and try to make sense of the co-citation networks that denote the field during this period. We pointed out in the previous sections that subsequent periods show greater fragmentation arising from exogenous theoretical influences and endogenous developments. In Figures 12 and 13, these are portrayed altogether to provide an overview of the field.

Figure 12 includes all islands (after the cutoff of 20 citations) that had at least two nodes. We try to interpret the four largest rather heterogeneous components as well, but nonetheless present Figure 13 without those factors that are very complex and as such add little illustrative and simplifying value. The Pathfinder analysis results provide many interesting insights about the network structure of the intellectual community in non-technological innovation. A large number of factors persist (19, in addition to four largest ones).

Four largest factors identify the influence of organizational theory, with a couple of influxes from industrial organization economics (e.g. Porter, 1985) and power/resource dependence school (e.g. Blau, 1964) in the first component; psychological safety and support in the second component (e.g. Edmondson, 1999); knowledge-based view with organizational learning (e.g. Argyris & Schon, 1978), leadership for innovation (e.g. Mumford, Scott, Gaddis, & Strange, 2002), and behavioral theory of the firm (Cyert & March, 1963) in the third component; and marketing of innovation in the fourth (e.g. Gatignon & Robertson, 1989).

Examination of the following six components reveals some other more dominant perspectives that delineate the field. Component five (1<sup>st</sup> in Figure 13, red circles) reveals the influence of behavioral theory and organization studies (e.g. March & Simon, 1958), as well as the importance of resource and knowledge-based view (e.g. Kogut & Zander, 1992; Grant, 1996). We thus label it ‘organization studies and knowledge-based view’. Some highly cited work on non-technological organizational innovation has been carried out by researchers in organizational studies.

Component six (2<sup>nd</sup> in Figure 13, green circles) is strongly dominated by marketing innovation and top management role in technological innovation (e.g. Howell & Higgins, 1990). It is thus termed ‘top management and marketing innovation’. Component seven (3<sup>rd</sup> in Figure 13, orange circles) includes works on ‘behavioral theory’ of the firm (Cyert & March, 1963), and other topics that adopt this



perspective or are informed by it and study diffusion of innovations (Cooper & Zmud, 1990), innovations in strategy, structure, and organizational process (Miles, Snow, Meyer, & Coleman Jr, 1978), or organizational creativity (Woodman et al., 1993). Another homogenous group is component eight (4<sup>th</sup> in Figure 13, light blue circles). This factor is also predominantly informed by ‘organization studies’ (e.g. Hage, 1980). Other components are smaller, but are nevertheless described in Figure 13. They include interesting studies on determinants of innovation, dynamic capabilities and absorptive capacity, technological innovation’ and its exploitation, sociology and management of innovation, competitive advantage, organizational behavior and conditions for innovation, creativity and organizational learning, modeling creativity and innovation, and diffusion of innovation in organizations.

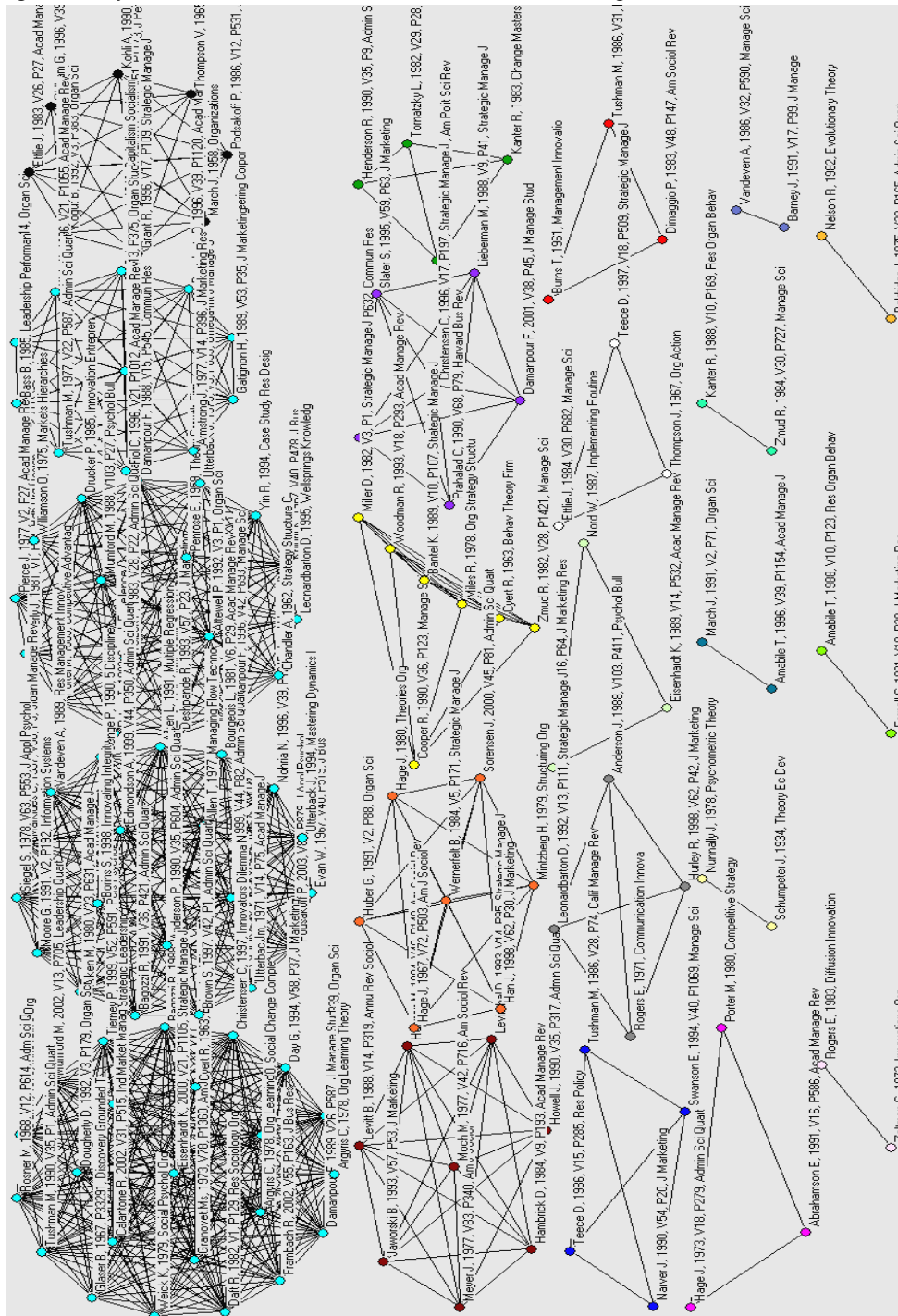


Figure 12 Co-Citation Network (1975-2011) – All Islands (Low = 2), Cutoff = 20 Co-Citations

After interpreting each of the components, we return to four largest clusters that are harder to interpret because of their heterogeneity. A pretty safe assumption is that target studies co-citing the first four clusters that include many perspectives are in fact recent studies on management innovation. This is a perfect example of how a dominant domain overrides other promising domains. Namely, management innovation includes many of the abovementioned perspectives and made them its own. This could deepen even more in the future in the hands of management innovation that has included many of the new influxes to the field. It could particularly be so if the scholars fail to recognize different types and definitions of non-technological innovation and term any kind of non-technical innovation as management innovation. This may not be optimal as this way the field rests on consensus building instead of critical reflection that can cause an evolution of the field.

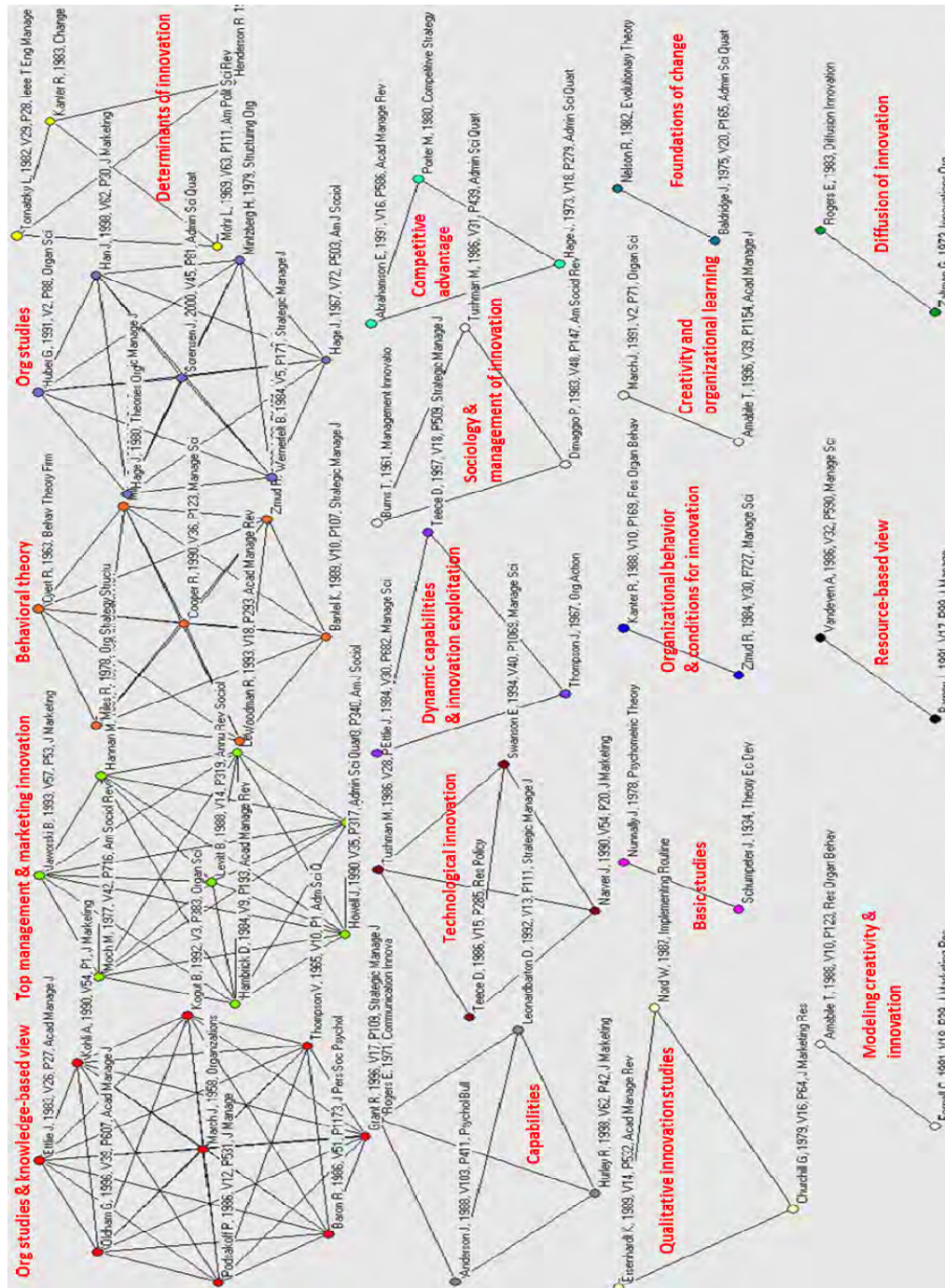


Figure 13 Co-Citation Network (1975-2011) – Without The First Four Islands (Low = 2), Cutoff = 20 Co-Citations

## 5 Comparative Discussion of Co-Citation Analysis Results

As we discussed and interpreted the findings of each period and altogether within the results section, and also focused on the content of each island in terms of differentiating between different forms of non-technological innovation, we use this section to compare our findings to quantitative (e.g. Fagerberg et al., 2012; Martin, 2012) reviews of the field of innovation in general to provide more insight into the similarities and differences of the two fields that are undoubtedly connected to each other.

'An Evolutionary Theory of Economic Change' (Nelson & Winter, 1982) appears to be the most crucial influence in the field of innovation, besides Schumpeter (1934). Nelson there combines Schumpeterian and evolutionary perspectives with theories on organizations and human behavior (Cyert & March, 1963) to produce a theory of how firm-level knowledge and its outcomes are shaped (Fagerberg et al., 2012). In our study, this book is only on the 22<sup>nd</sup> place of most influential pieces in terms of times cited by the primary articles in our analysis. Nevertheless, even though it is written by two economists, it has found a large audience among business and management scholars. Other 17 pieces on the Top 20 contributions list by Fagerberg et al. (2012) cannot be traced among the top 30 contributions in our study. The only two other exceptions to this rule are the book by Rogers (1983) that is recognized as seminal work to the diffusion scholarship within innovation studies and Cohen and Levinthal's (1990) ASQ article 'Absorptive capacity: a new perspective on learning and innovation'.

Contrasting to the list of Fagerberg et al. (2012), where articles and books by economists (e.g. Schumpeter, 1934; Freeman, 1974) and institutional and strategic business scholars (e.g. Porter, 1990; Saxenian, 1996) are mostly present, our top contributions list is dominated by management and organization scholars (Daft, 1978; Kimberly & Evanisko, 1981; Damanpour, 1991). This indicates that organizational studies and a more in-box perspective have always driven research on non-technological innovation, in contrast with innovation studies in general that are much more macro- and economy-oriented.

Another difference between the knowledge base of the two fields is related to the temporal component; studies that form the knowledge base of innovation are, in general, much older than studies that represent the core of the knowledge of non-technological innovation. A pretty straightforward explanation is that the field of non-technological innovation in itself has started to develop much later, which naturally causes this effect. Comparing the evolution of the field, it is apparent that the field of non-technological innovation has grown a lot more in the last couple of years with a pattern that resembles an exponential curve, whereas the field of innovation in general, although also growing, has done so at a much steadier pace. Given that the field of innovation also encompasses non-technological innovation as a subfield, we could make a conclusion that it has grown predominantly based on the increasing popularity of non-technological innovation among the researchers.

These differences in top contributions aside, Fagerberg et al. (2012) were also able to draw a graphical representation of the content-wise clusters in their sample of contributions. Based on the number of pieces in each cluster, two main polar groups arise: economics of R&D that emphasizes the role of technology and innovation in economic in social change; organizing innovation, which focuses on innovation in firms and is popular among scholars in business and management (Fagerberg et al., 2012). The former had a lot less influence in the field of non-technological innovation, whereas the latter is also core to our studied field. A third branch of research can also be distinguished from their drawing and that is innovation systems that in fact keeps the other two parts of the knowledge base connected, which also has importantly influenced the field of non-technological innovation.

It appears that the importance of individual-level innovation studies is much more important for the field of non-technological innovation than it is for the field of innovation in general. As mentioned, the influence of psychology that has penetrated the field of non-technological innovation through the work of Baldrige and Burnham (1975) is crucial for its development. Such occurrence is not apparent in the field of innovation in general. One manifestation of this influence is related to two different definitions of management innovation, for example, which are very tightly related to multi-level issues. On one hand, there is a person-centric definition of Hamel (2006\_ENREF\_100) – what managers are and how they do something differently, whereas a more organization studies-based perspective offers an organizational-level definition: new approaches to devise strategy and structure of tasks and units, modify the organization's management processes and administrative systems, motivate and reward organizational members, and enable organizational adaptation and change (Damanpour & Aravind, 2012).

It is thus not surprising that the review of Damanpour and Aravind (2012), with the organizational studies background of the authors, focuses at the firm level. A definition of management innovation by



Birkinshaw et al. (2008) goes across more levels; these are innovations in organizational form, practices, processes, or techniques, and constitute the rules and routines that describe how work gets done inside organizations (Birkinshaw et al., 2008). Yet even if, 'for parsimony', the authors intend to conceptualize management innovation as an overarching construct for all types of non-technological innovation (Damanpour & Aravind, 2012), they do not include, for example open or marketing innovations, nor do they include any notion of non-technological innovation by the employees (other than the managers).

Creativity is another very interesting topic with important influence within the non-technological innovation literature. Co-citation analyses reveal some crucial insights. First, creativity is not the only psychological and individual-level influence in the field, as individual innovation is in fact the one perspective that sits at the very core of the field development. Second, creativity with its influx in the second part of the examined time frame had a crucial impact on the field of non-technological innovation, which is not true for the field of innovation in general. Third, creativity itself had two major paths within the field: one coming straight from psychology and focusing more at the individual level (Amabile et al., 1996), whereas the second domain derived more from the innovation literature (based on disciplines such as industrial economics, strategy, organizational studies, etc.) and was also more organization level-based (e.g. Woodman et al., 1993). This by itself results in many multi-level issues and even more confusion that is caused by a relative independence of research streams of creativity and innovation. Fourth, creativity is often simply listed as an antecedent of innovation, with little attention paid into how, through which mechanisms, and under which conditions the two processes are related.

We also compare my results with Martin's (2012) citation analysis of the field of innovation studies and science policy. Nelson and Winter (1982) as well as Rogers (1983\_ENREF\_128) were also present here, as in the study by Fagerberg et al. (2012). Contrasting to the latter study, Martin (2012) found another piece that we identified to be of crucial importance for the field of non-technological innovation - Nonaka and Takeuchi's (1995): 'The knowledge-creating company'. Other top contributions reveal similar results as Fagerberg et al. (2012) in terms of the differences from non-technological innovation. Martin (2012) also found that the field is mostly influenced by economic, institutional, and social change scholars, with the exception of a couple of 'outside' influences that are, however, also not on the list of most important contributors in the field of non-technological innovation.

In terms of the sources of influences on the field of innovation studies and science policy, Martin (2012) discovered that during the earlier years of the field (before 1980), many different disciplines influenced it after the work of Schumpeter (1934), such as economics (authors such as Arrow and Sollow) that was probably the most influential, sociology (e.g. Rogers, 1983), management (e.g. Utterback & Abernathy, 1975), and organizational studies (e.g. Cyert & March, 1963).

He also found that these separated parts of the field started to coalesce into a more coherent field centered on the adoption of an evolutionary (or neo-Schumpeterian) economics framework (e.g. Nelson & Winter, 1982; Rosenberg, 1982), an interactive model of the innovation process (encompassing management of technology, e.g. Porter, 1985, but also accounting for organizational innovation, Kimberly & Evanisko, 1981, resource-based view, e.g. Barney, 1991; Hamel, 1991, and organizational learning and knowledge management, e.g. Nonaka & Takeuchi, 1995, as well as inter-organizational collaboration and open innovation, e.g. Chesbrough, 2003), and (a little later) the concept of 'systems of innovation' (Saxenian, 1996). Thus, after 1980 we can see that there is quite an overlap in terms of the key areas of influence for innovation studies and for non-technological innovation studies (with the exception of an evolutionary economics framework which, besides the work of Nelson and Winter, 1982, did not influence the field as much). This further depicts non-technological innovation as an important driver of the scientific growth of innovation studies.

## 6 Conclusion

Our research goes beyond a traditional qualitative review, which has more or less rigorously already been conducted on a large part of this field (cf. Damanpour & Aravind, 2012). Co-citation analysis is useful because it provides an objective and 'aerial' view. It shows how citers, often numbering in the hundreds, jointly perceive the relationships among key writers in the field (White & Griffith, 1981). A map based on co-citation data thus sheds light on the social construction of the non-technological innovation field by its members. A longitudinal comparison of the maps across the era 1975-2011, a significant slice of the history of the field of non-technological innovation, also informs us about the changes occurring in the social construction of the field and the evolving consensus about the domain of the field.

Spatial maps illustrate the network of studies that provide insight into which themes constitute the nucleus of the non-technological innovation field and where the knowledge came from. Using Pathfinder analysis with Island procedure, we were able to represent the networks of relationships among the most-cited studies within the field of non-technological innovation and group them under common themes. Thus, we were able to provide an illustrative description of the knowledge base constituted by accumulated works of research within the non-technological innovation field. This provides important insights into the intellectual structure of the field and where its subtopics are derived from. The identification of structural holes within the intellectual network of the non-technological innovation field suggests both opportunities for closure and brokerage that could contribute to the future development of the field.

We were also able to identify which parts have been the ones where new ideas have emerged. This has important implications for the field, because it provides insight and understanding of the knowledge that the field has produced. It also serves as delineation of the field from the field of innovation in general. The approach we have used and its results represent important means for cementing the status of non-technological innovation as a scientific field of its own, helping it become independent from the field of innovation in general. In addition, we were able to identify the sub-disciplines of the field. As these overlap with several types and forms of non-technological innovation, our study serves as means to provide better distinction between them.

From the co-citation analyses, it is evident that non-technological innovation, so far, lacks a single identity. This fact has to do with conceptual confusion and with ambiguous overlapping definitions. It is intertwined with innovation in general and also (naturally) heavily influenced by innovation studies, which usually adopt an organizational-level or even more macro/strategic perspective. However, it differs from this basic general field of innovation due to the fact that it was heavily influenced from psychology and sociology (behavioral theory) from the beginning. The non-technological innovation field has also received important and influential influxes in the last two examined periods from resource- and knowledge-based perspectives, as well as from creativity literature that is also based on psychology. Nevertheless, it has predominantly progressed organically, mostly dominated by organization (innovation) studies.

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# Analysis of CCHP and Distributed System on Energy Consumption in Northeast China

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**Abstract:** As a feasible way to save energy and reduce carbon emission, combined cooling heating and power (CCHP) gains a lot controversial debate about energy consumption. This paper focuses on the establishment of the CCHP system and points of the system mathematical equations in energy consumption. There is a simple example of a CCHP project feasibility study in Northeast China analysis. The CCHP option, fitting the cooling area technical constraints, is feasible for energy comparison.

**Key words:** Combined cooling heat and power (CCHP); Energy consumption; Distributed system; District cooling;

## 1 Introduction

The CCHP is a kind of based on the concept of energy system based on cooling; heating and power generation process integration of all-round can always system. In recent years, China's cogeneration developed rapidly, but district cooling system is less widely application than district heating system. Because of district cooling system has many advantages it is taken seriously more and more. In 1962 the United States in Harford city, Connecticut built the world's first district cooling system, now the U.S. has more than 60 district cooling system; In Asia ,Japan's district cooling system is growing the fastest; Europe has more power and cooling unit system is in operation. However in our country, district cooling system based on cogeneration has just started, but development is rapid, such as CCHP of JiNan the total capacity of cooling develop from zero to 49.6 MW, with gas turbine as foundation gas cogeneration has emerged.

## 2 Energy Consumption Calculation of Distributed System

The working principle of distributed system as shown in figure 1 below

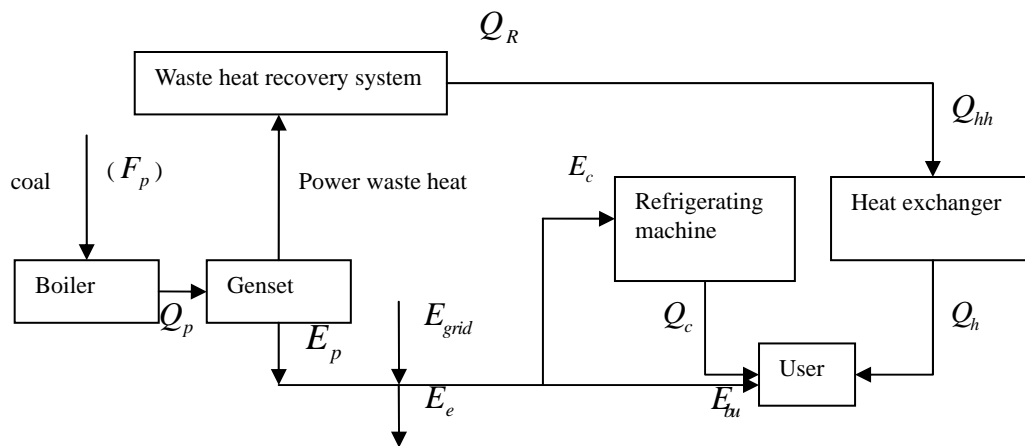


Figure 1 The Working Principle of Distributed System

### 2.1 Establishing energy consumption modelling

The different between distributed system and CCHP is the way to provide cold load. The distributed system is that setting up user self-built cold source set in where needs cold load, so just need to calculate power consumption, but in the comparison need to calculate the power grid transmission efficiency

Estimate in power consumption of user self-built cold source set according to the type 1 and 2:

$$Q_{ec} = \mu_c Q_c \tag{1}$$

$$Q_{ecy} = \mu_c Q_c \tau_c \tag{2}$$

In the formula:  $Q_{ecy}$  —System power consumption, kWh;

$Q_{ec}$  —System design power consumption, kW;

$\mu_c$  —system design power consumption of Unit cold quantity.

### 3 Energy consumption calculation of CCHP

The working principle of CCHP as shown in figure 2 below

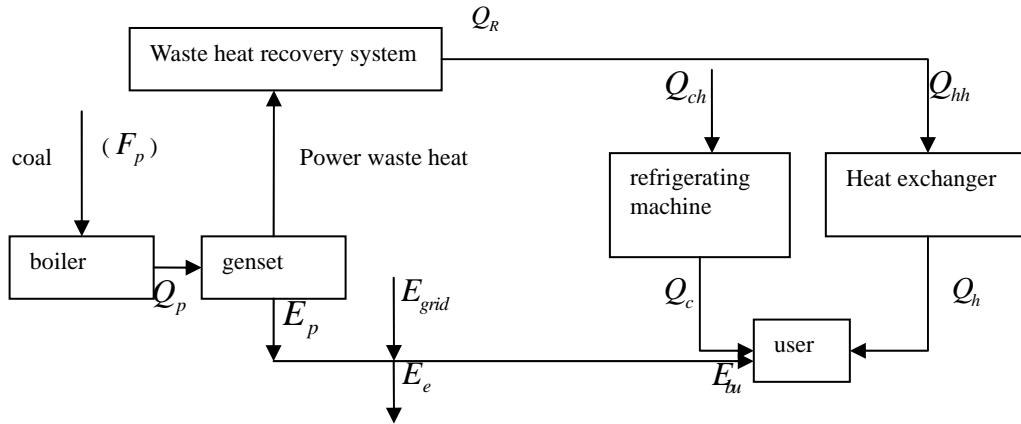


Figure 2 The Working Principle of CCHP

#### 3.1 Establishing energy consumption modeling

In CCHP, the user gets cold quantity directly through steam rather than electricity.

CCHP generating efficiency of low parameters steam can be estimated by parameters capacity loss to do work according to type 3

$$e_x = (h - h_0) - T_0(s - s_0) \tag{3}$$

In the formula:  $e_x$  —Steam power capability, kJ/kg;

$h$ 、 $h_0$  —Steam medium and the state of the environment enthalpy, kJ/kg;

$s$ 、 $s_0$  —Steam medium and the environment of state entropy, kJ/(kgK);

$T_0$  —Temperature of environmental state, K.

As known system source load, estimation CCHP power consumption according to type 4 and 5.

$$Q_{ecs} = \mu_s Q_{cs} \tag{4}$$

$$Q_{ccsy} = \mu_s \tau_c Q_{cs} \tag{5}$$

In the formula:  $Q_{ccsy}$  —Power consumption of CCHP, kWh;

$Q_{ecs}$  —Design power consumption of CCHP, kW;

$\mu_s$  —System unit co-production cold quantity system design power consumption.

#### 3.2 The calculation of equivalent efficiency

When output the same cold quantity, we can think that absorption machine use more heat consumption exchange for less power consumption. So this process can be equivalent to a power generation process, and its power generation efficiency can be calculated by type 6.

$$\eta_c = Q_{ecy} - Q_{ccsy} / Q_{ch} \eta_{sp} \tag{6}$$

In the formula:  $\eta_c$  —Equivalent power efficiency, %;

$Q_{ch}$  —Design recovery quantity of waste heat, kW;

$\eta_{sp}$  —Grid transmission efficiency, %.

### 3.3 The calculation of coal consumption

Firstly steam content consumption of CCHP should be converted into standard coal consumption quantity, which can be calculated by type 7.

$$G_c = 3600 Q_{ch} / q_c \quad (7)$$

In the formula:  $G_c$  —Translate heat into coal quantity, kg;

$q_c$  —Steam and condensate enthalpy difference, kJ/kg.

Secondly CCHP system consumes more waste heat and reduces reduce power consumption, which equivalents to power generation, so equivalent coal quantity can be calculated by type 8.

$$g_c = 1000 G_c / (Q_{ecy} - Q_{ecsy}) \quad (8)$$

In the formula:  $g_c$  —Equivalent coal consumption, g/kWh.

So annual coal saving capacity can be calculated by type 9.

$$\Delta G_c = 1000 Q_{ch} / (g - g_c) \quad (9)$$

## 4 Case Analyses

There is a simple example of a CCHP project. Installed capacity: there are four boilers which total capacity is 300t/h(4×75t/h),and three turbo generator sets which total capacity is 42MW. Actual heating area is four million square meters, gross building area is one hundred and fifty thousand square meters, and air conditioning area is one hundred square meters.

### 4.1 Energy consumption calculation of distributed system

Setting up user self-built cold source set is just need to calculate power consumption. Every 1000 RT (3517 kW) according to the shaft power estimate as follows: the main engine is 650 kW, cooling tower is 30 kW, cooling water pump is 90 kW, cold water level 1 pump is 55 kW, and they added up to 825 kW / 1000 RT. Total years cold load is  $1.3 \times 10^7$  kWh, which converts into full load time is

$$1.3 \times 10^7 \text{ kWh} \div (6250 \text{ RT} \times 3.517) = 592 \text{ h.}$$

Annual electricity consumption of setting up user self-built cold source set:

$$6.25 \times 825 \times 592 = 3.053 \text{ GWh.}$$

So annual electricity consumption is 3.053GWh.

### 4.2 Energy consumption calculation of CCHP

1) Calculation of power consumption

System design working conditions power consumption:

$$1563 \text{ kW} \times 20156.48 \div (6978 \times 3) = 1504.9 \text{ kW};$$

Converts into full load time is 592h, annual electricity consumption is

$$1504.9 \text{ kW} \times 592 \text{ h} = 0.891 \text{ GWh}$$

2) Calculation of steam consumption

Single 6978 kW installed cooling quantity steam consumption for 8838 kg/h. Total steam consumption :

$$8838 \text{ kg/h} \times 20156.48 \div (6978 \times 3) \times 592 \text{ h} = 5.037 \times 10^6 \text{ kg}$$

3) The calculation of equivalent efficiency

CCHP system consumes the amount of steam 0.8MPa saturated steam  $5.037 \times 10^6$  kg, less consumption of electricity:  $3.053 - 0.891 = 2.162$  GWh; Steam and condensate enthalpy difference is much heat consumption

$$Q_h = Ah \times G = (2768 - 84.0) \times 5.037 \times 10^6 \div 3600 = 3.756 \text{ GWh}$$

$$\eta_c = W_0 - W / Q_h \eta_{sp} = 2,161,675 / (3,756,243 \times 0.92) = 62.6\%$$

4) The amount of steam will be converted into standard coal , which equivalents to coal consumption

$$3,755,243 \times 3600 \div 29270 = 461,867,9 \text{ kg}$$

$$461,867.9 \div 2.162 \text{ GWh} \times 1000 = 213,7 \text{ g/kWh.}$$



This value is much lower than the national average coal consumption in recent years. Therefore, CCHP system is more favorable than distributed system on the energy consumption.

## 5 Conclusion

This paper mainly analyzes something on the energy consumption of regional CCHP, and through the actual cases can come to the conclusion that fitting the cooling area technical constraints, the CCHP is superior to distributed system in energy consumption. This study can provide guidance for the application of CCHP.

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# Analysis of Coordination Degree of China's Financial Development and Economic Development Based on Systems Engineering\*

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**Abstract:** Studying the degree of coordination between economic and social development is of great significance to analyze a region's sustainable development ability quantitatively and promote the healthy development of economic society. The paper employs the coordination degree measure model based on systems engineering, conducting the unit root test, the co-integration test and the Principal Component Analysis, to calculate the static and dynamic coordination degree between financial development and economic development from 1992 to 2010. The conclusions of our research are that the static coordination degree is in a quite good status over 19 years except for two lower values respectively in the year of 1994 and 2009, similarly the dynamic coordination degree is showing an upward trend on the whole except for twice obvious decline respectively from 1993 to 1995 and from 2008 to 2010. It is because that the economy has separately suffered an overheating and a crisis during these two periods. In brief, the conclusions are matched with the actual situation of China.

**Key words:** Coordination degree; Financial development; Economic development; Empirical analysis

## 1 Introduction

The concept of coordination degree has been proposed by the Sustainable Development Strategy Study Group of the Chinese Academy of Sciences in the research about the sustainable development ability. Coordination degree can be defined as the harmonious and consistent degree of various association relations between different systems or among inner elements of the system. It not only forms the representation of the sustainable development ability, but also is the regulator of the sustainable development ability which is constantly optimized. Studying the degree of coordination between economic and social development is of great significance to analyze a region's sustainable development ability quantitatively and promote the healthy development of economic society.

## 2 Related Literature

The literatures about coordination degree of financial development and economic development are less than that of financial development and economic growth throughout the world. However, some of these literatures still have reference values, such as providing research methods and perspectives etc. This section mainly introduces some empirical studies on coordination degree of financial development and economic development made by China's scholars.

Wei Zhong and Huanchen Wang(2004)<sup>[1]</sup> investigate the degree of intra-impact and coordinated development between financial sector and industrial sector based on the data of China's industrial economy as well as financial development from 1980 to 2002, by using the concept and model of the coordinated theory. The results show that the coordination of two kinds of sectors is strengthened gradually, and the financial sector positively supports the stable and healthy growth of industrial economy. Fangmin Qian, Ke Sun and Zhongyao Tang(2008)<sup>[2]</sup> conduct an empirical analysis on 11 municipalities in Zhejiang province, using econometric models, to analyze the relationship between regional financial development and economic development. The conclusions are that the relationship not only possesses the regional characteristics, but also has the periodic characteristics.

Shouwei Li and Jianmin He(2009)<sup>[4]</sup> use the coordination degree measure model structured by Membership Function in fuzzy mathematics, based on the data of China from 1991 to 2007, to analyze the coordination of financial development and economic development. It is concluded that the coordination of financial development and economic development are in coordination level in almost all years except for the year of 1991, revealing the coordination level is high in general, but it has a downside after 2006; meanwhile, the coordination of securities market development and economic

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development are also in coordination level in almost all years except for the year from 1991 to 1993, however, it is descending after 2003. The conclusion has a certain practical significance to coordinated development of China's finance and economy.

Zhiqi Den(2011)<sup>[5]</sup> builds an evaluation system of development level of real economic system – financial system based on the western provinces' data from 2000 to 2008. It is found that the development level is between low and lower, and the degree of coordination is between basic level and primary level, while the development degree of coordination is located in moderate uncoordinated stage.

### 3 Model and Index

Currently, the research on coordination degree of financial development and economic development mostly adopts such method, which combines the Principal Component Analysis(PCA) together with the coordination degree measure model in fuzzy mathematics. To be specific, this paper firstly builds the index systems of financial development and economic development respectively, then calculates the comprehensive levels of each other by using PCA. Finally, apply comprehensive levels to establish the regression models, then to compute the adaptive values of financial development to economic development as well as economic development to financial development with the regression models. Subsequently, based on these two kinds of adaptive values, the static coordination degree will be calculated with coordination degree measure model. According, dynamic coordination degree can be calculated by utilizing static coordination degree.

#### 3.1 Principal component analysis

PCA will reorganize the original and correlated indexes into a set of new and unrelated indicators ( $F_i$ ). PCA computes new variables called principal components which are obtained as linear combinations of the original variables. The greater the variance of the principal component is, the more information it contains and more important it is. Therefore, the first principal component ( $F_1$ ) is required to have the largest variance. Then the second principal component ( $F_2$ ) will be selected with the second largest variance if  $F_1$  cannot contain enough information of the original indexes. In order to reflect the original information effectively,  $F_2$  is computed under the constraint of being orthogonal to  $F_1$ , that is  $COV(F_1, F_2)=0$ . The other components are computed likewise.

$$F_i = a_{1i} ZX_1 + a_{2i} ZX_2 + \dots + a_{ni} ZX_n \quad (1)$$

$F_i$  represents the  $i$ th principal component.  $ZX_j$  is the standardized data of the  $j$ th variable. In practice, every variable has different unit and magnitude order. Standardization can eliminate the influence of dimension to treat every variable fairly.  $n$  is the number of original variables.  $a_{ji}$  is the coefficient of  $X_j$  in linear combination of  $F_i$ , which interprets the size of correlation between  $X_j$  and  $F_i$ .

After each principal component is achieved, studying all of them will lose the original intention of dimension reduction. Only some of them with relatively larger variance need to be studied. Commonly, accumulative contribution rate of variance is required to reach 85% or more. When the principal components to be studied are identified, comprehensive level is calculated by using weighed average method, with these principal components as its variables and their variance contribution rates as weights.

In this paper, the comprehensive level of economic development( $E$ ) is gained when  $X$  in the formula(1) is changed into the relevant variables of economic development, so do the comprehensive level of financial development( $F$ ). Then, regression equation is built to get respective adaptive value, that is:

$$E_i = f(F_i) \quad (2)$$

The adaptive value of economic development to financial development, denoted by  $E_F$ , is obtained with  $F$  and the formula(2). Whereas, applying  $E$  and the inverse operation of the formula(2) to get the adaptive value of financial development to economic development, denoted by  $F_E$ .

#### 3.2 Coordination degree measure model

Coordination degree, which is considered to be a fuzzy concept with clear connotation but unclear epitaxy, is usually described by the membership degree concept in fuzzy mathematics. How the membership degree is varying could be reflected by Membership Function. The formulation of the coordination degree function is as follow:

$$u_s = \exp\left(\frac{-(x - x')^2}{s^2}\right) \tag{3}$$

$u_s$  represents the coordination degree.  $x$  is the actual value.  $x'$  is the adaptive value derived from regression equation.  $s^2$  is the mean square error.

Taking two systems(i and j) as an example to compute the coordination degree of i to j( $u_{(i/j)}$ ) and the coordination degree of j to i( $u_{(j/i)}$ ) firstly.

$$u_{(i/j)} = \exp\left(\frac{-(x_i - x'_i)^2}{s_i^2}\right) \tag{4}$$

$$u_{(j/i)} = \exp\left(\frac{-(x_j - x'_j)^2}{s_j^2}\right) \tag{5}$$

The static coordination degree between two systems can be calculated by the formula below:

$$C_{(i,j)} = \frac{\min\{u_{(i/j)}, u_{(j/i)}\}}{\max\{u_{(i/j)}, u_{(j/i)}\}} \tag{6}$$

The dynamic coordination degree can be obtained with the static coordination degree, i.e.:

$$C_{d(i,j)}(t) = \frac{1}{T} \sum_{i=0}^{T-1} C_{(i,j)}(t-i) \tag{7}$$

$C_{d(i,j)}(t)$  signifies the dynamic coordination degree of i and j at t moment, whilst  $C_{(i,j)}(t-i)$  interprets the static coordination degree at every moment. If  $C_d(t_1)$  at time of  $t_1$  is less than  $C_d(t_2)$  at time of  $t_2$ , where  $t_1$  is less than  $t_2$ , i and j are in coordinated development state.

The purpose of this paper is to study the coordination degree of financial development and economic development, so coordination degree is gained when system i and system j are replaced with F and E respectively.

### 3.3 Selection and treatment of index

This paper adopts the annual data of China from 1992 to 2010. On one hand, not only the coordination degree itself is a broader category but also economic development and financial development pursuit coordinated development in the long-term development. So relatively speaking, annual data will be more rational. On the other hand, the research with quarterly data has already been comprehensive and meticulous, together with the securities market of China has rapidly developed since 1991. Hence, the sample interval with the data after 1992 would be the best supplement for existing researches.

**Table 1 Related Indexes of Economic Development**

Index	Reflecting aspect	Sign
Per capita real GDP	Economic growth based on efficiency	PGDP
Gross export and import	Foreign trade situation	TRA
Total investment in fixed assets	Investment situation	IN
Total volume of retail sales of social commodities	Peoples' material and culture levels	RS
Urban per capita disposable income	Residents income	INCP
Total factor productivity	Input-output efficiency	TFP
Urbanization rate	Urbanization rate	URB
Proportion of output value in tertiary industry	Economic structure	GST
Growth rate of per capita GDP	Economic growth rate	PGDPR
Growth rate of import and export	Trade growth rate	TRAR
Growth rate of total investment in fixed asset	Investment growth rate	INR
Growth rate of retail sales volume of social commodities	Commodity retail growth rate	RSR

**Table 2 Related indexes of financial development**

Index	Reflecting aspect	Sign
Financial interrelations ratio	Scale of financial relative to the economic aggregate	FIR
Total deposit and loan to GDP	Development scale of the bank	BANK
Circulated market value to GDP	Development scale of the stock market	SAC
Proportion of securities on financial assents	Financial structure	ATR
Loan to deposit	Efficiency of financial intermediary	RLS
Turnover rate	Efficiency of financial market	TURN
Growth rate of broad money M2	Rate of economic monetization	M2

## 4 Empirical Analysis

### 4.1 Data preprocessing

Before analysis, standardizing each variable with SPSS is necessary. The standardized formula is as follow:

$$\hat{x}_i = \frac{x_i - E(x_i)}{std(x_i)} \tag{8}$$

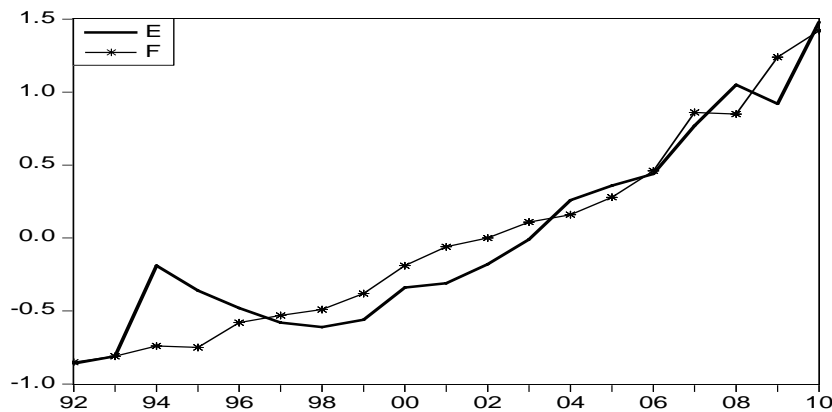
$x_i$  is the original value of each variable.  $E(x_i)$  is the arithmetic mean of  $x_i$ .  $std(x_i)$  is the standard deviation of  $x_i$ .

Correlation between variables is the premise of conducting PCA. Thus, the correlation coefficients between financial development variables as well as between economic development variables should be estimated before analysis. The correlation coefficient matrixes display that there is a strong correlation between financial development variables, so is between economic development variables. Consequently, by extracting principal component to do PCA is feasible.

### 4.2 Calculation of comprehensive level

Three principal components are extracted from the economic development variables, as well as from financial development variables. The cumulative contribution rate of variance of each other reach 91.56% and 94.10% respectively. It can clearly be seen that the information extraction of variables by PCA is satisfactory.

The comprehensive levels of economic development and financial development are calculated respectively, with the extracted three principal components as variables and the contribution rates of variance of each other as weights, see figureure 1.



**Figure 1 Comprehensive Levels of Economic Development and Financial Development over the Years**

Figure 1 displays the comprehensive scores of economic development and financial development since 1992. The results of figureure exhibit that the comprehensive level of economic development is increasing on the whole except for two period of from 1995 to 1998 and 2009. Relatively speaking, the

comprehensive level of financial development shows a more steady rise feature, only a decline under the impact of the global financial crisis in 2008, demonstrating the comprehensive level of financial development has been improved significantly in recent years.

**4.3 Calculation of adaptive value**

Given the results of the unit root test, the comprehensive levels of financial development and economic development are non-stationary, but their first order difference are stationary, implying both are integrated of order one. Before fitting regression equations with the comprehensive levels of financial development and economic development, it is necessary to perform the co-integration test in order to avoiding the spurious regression. Using maximum-trace method discovers that there is a co-integration relationship between comprehensive level of financial development and economic development's, furthermore with intercept in co-integration equation. Therefore, regressions can be made, and the coefficients can be estimated by the least square method. Regression equations are as follows:

$$F_t = 0.9924 \times E_t \tag{9}$$

$$E_t = 0.9149 \times F_t \tag{10}$$

Upon testing, the goodness of fit of two equations both are above 0.9, meanwhile the residuals are stable without autocorrelation and heteroscedasticity. So adaptive values of E and F calculated from these two equations are reliable.

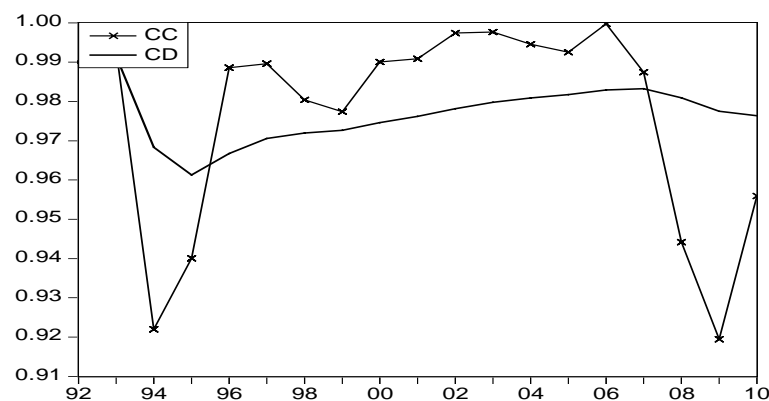
**4.4 Calculation of coordination degree**

Adaptive values of financial development and economic development to each other are computed by utilizing formula(9) and formula(10), as follows:

**Table 3 Original Values and Adaptive Values of Financial Development and Economic Development**

	F	F <sub>E</sub>	E	E <sub>F</sub>
1992	-0.85	-0.85349	-0.86	-0.7777
1993	-0.81	-0.80387	-0.81	-0.7411
1994	-0.74	-0.18856	-0.19	-0.67706
1995	-0.75	-0.35728	-0.36	-0.68621
1996	-0.58	-0.47637	-0.48	-0.53067
1997	-0.53	-0.57561	-0.58	-0.48492
1998	-0.49	-0.60538	-0.61	-0.44832
1999	-0.38	-0.55576	-0.56	-0.34768
2000	-0.19	-0.33743	-0.34	-0.17384
2001	-0.06	-0.30765	-0.31	-0.0549
2002	0	-0.17864	-0.18	0
2003	0.11	-0.00992	-0.01	0.100644
2004	0.16	0.258033	0.26	0.146391
2005	0.28	0.357276	0.36	0.256184
2006	0.46	0.436671	0.44	0.420874
2007	0.86	0.764174	0.77	0.786851
2008	0.85	1.042056	1.05	0.777702
2009	1.24	0.913039	0.92	1.134529
2010	1.42	1.468802	1.48	1.299219

The static coordination degrees(CC) of financial development and economic development are achieved by formula(6), then using formula(7) to get the dynamic coordination degrees(CD), see figure 2:



**Figure 2 Static and Dynamic Coordination Degrees of Financial Development and Economic Development**

## 5 Conclusion

CC reports the degree of coordination between financial development and economic development at some point, and its values are always fluctuating between 0.92 and 1 during the period of 1992 to 2010. The values of CC are larger, so the coordination of financial development and economic development is in a quite good status over 19 years. But it is also can be seen from the picture obviously that coordination in different years are quite different. In particular, there are two lower values respectively in the year of 1994 and 2009. Because economy experienced an overheating in 1994, economy appears serious inflation (inflation rate was more than 20%). Moreover, the stock surged in 1993 but crashed in 1994. Indeed, in the scale, financial development is not coordinated enough with the economic development. The stock market was the bull market in 2009, with the loose monetary policy in early time, so the data of financial development variables is more perfect; Although China's gross domestic product has increased by 8.7% in 2009, the per capital real GDP and total imports and exports has a negative growth. Altogether, economic development does not keep up with the bull market of financial development.

CD mirrors the degree of coordination between financial development and economic development over a longer period of time. From figure 2, the dynamic coordination degree of financial development and economic development is showing an upward trend on the whole, indicating that financial development is more coordinated with the economic development. But still there are twice obvious decline, respectively from 1993 to 1995 and from 2008 to 2010. As mentioned above, the economy has separately suffered an overheating and a crisis during these two periods. Thus we can say that this paper draws a matched conclusion with the actual situation of China.

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# Empirical Research on the Effect of Scientific and Technological Innovation on the Export of High-Tech Products in China

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**Abstract:** Export of high-tech products and its share in export trade can adequately reflect a nation's or region's economic development level and its position in international trade. The export of high-tech products depends on industrial development level, while industrial development level depends on its Scientific and Technological(S&T) innovation capability. Hence, the relationship between regional S&T innovation capability and export of high-tech products is a subject widely researched in recently years. According to statistical data during 2005 to 2010, the paper evaluates S&T innovation capability of China's 30 provinces synthetically by means of factor analysis method. And then analyzes the relationship between S&T innovation capability and export of high-tech products for several consecutive years by means of correlate and regression analysis method. The results reveal that regional S&T innovation capability and export of high-tech products have close correlation and stable relationship. Additionally, regional S&T innovation capability plays a tremendous role in promoting export of high-tech products.

**Keywords:** S&T innovation; Factor analysis; Export; High-tech products; Regression analysis

## 1 Introduction

Under the urgent pressure of resource and environment, China now has to try to transform from a large trading nation to a strong trading one. It should be pointed out that a strong trading nation is firstly embodied in structure of export products. In 2009, China's general export hits 1201.612 billion dollars. Export of industrial manufactured goods hits 1138.483 billion dollars, 94.75% of general export; while export of high-tech products hits 376.931 billion dollars, only 31.37% of export of industrial manufactured goods, with large proportion of processing trade. It is clear that the export expansion of high-tech products depends on national S&T level and S&T innovation capability.

In 40's, people began to research the theory of technology innovation in trade. Posner (1961) put forward the technology gap theory, Vernon (1966) proposed the product cycle theory, Grober(1967) presented R&D factors theory. Subsequently, people furthered to research the effect of technology innovation on export. Christine Greehalgh (1996) empirically analyzed the impact of technology innovation on British export using technology innovation and intellectual property as variables. Gustavsson (1999) established a econometric model to study the effect of technology, resources and economies of scale on the international competitiveness of OECD countries. They think R&D is essential for the development of international competitiveness of high-tech industries.

In recent years, more and more Chinese scholars have begun to study the relationship between technology innovation and export by various methods. For instance, Jian Chen(2006) and Youqun Guo(2007) analyzed the relationship between innovation capability and export of high- tech products separately using co-integration analysis method and panel data model. As S&T innovation is a complicated process, it is difficult to measure its quality and quantity. Thus, S&T innovation capability cannot be sufficiently reflected by several direct indexes like S&T innovation inputs or results. While researches mentioned-above all select direct indexes.

In order to avoid the one-sidedness of selecting S&T variables, the paper establishes a relatively comprehensive index system to measure regional scientific research and technological innovation. In addition, the paper adopts factor analysis method to evaluate S&T innovation capability of China's 30 provinces according to statistical data during 2005 to 2010; and then analyze the relationship between S&T innovation capability and export of high-tech products for several consecutive years by means of correlate and regression method.

## 2 Methodology



## 2.1 Index system specification

On the basis of related research results in recent years, the paper establishes a set of index system in line with the principles of comprehensive, close correlation and data accessibility, which consists of four first-grade indexes including Basic Conditions, Actual Inputs, R&D Results and Technology Trades, and two to five second-grade indexes under each first-grade index.

For convenience, the paper sets thirteen second-grade indexes as variables, marked  $X_i$  ( $i=1,2,3\dots13$ ) (Table 1). As the paper studies S&T innovation capability of 30 provinces, each variable has 30 observed values, marked  $X_{ij}$  ( $i=1,2,3\dots30$ ).

**Table 1 Evaluation Index System of Regional S&T Innovation Capability**

First-grade Index	Second-grade Index	Variable
Basic Conditions	Number of Institutions (unit)	$X_1$
	Number of R&D Institutions in Large and Medium-sized Industrial Enterprises (unit)	$X_2$
	Number of R&D Institutions (unit)	$X_3$
	Population of Junior College and Above (person)	$X_4$
	Number of Total S&T Personnel (person)	$X_5$
Actual inputs	Region Expenditure for Science and Technology (100 million yuan)	$X_6$
	Intramural Expenditure on R&D (100 million yuan)	$X_7$
	Full-time Equivalent of R&D Personnel (man-year)	$X_8$
R&D Results	Domestic Patents Granted (piece)	$X_9$
	Number of Chinese Scientific Papers Taken by Major Foreign Referencing System (piece)	$X_{10}$
	Sales Revenue of New Products as a Percentage of Total Revenue from the Sale of Products (%)	$X_{11}$
Technology Trades	Value of Contract Deals in Domestic Technical Markets (10000 yuan)	$X_{12}$
	Value of Technology Contracts Imported (10000 USD)	$X_{13}$

## 2.2 Data

The study depends on the data from China Statistical Yearbook and China Statistical Yearbook on Science and Technology. Due to the change of statistical indexes, the paper substitutes statistical data of S&T Institutions in large and medium-sized industrial enterprises from 2006 to 2008 for statistical data of R&D institutions in large and medium-sized industrial enterprises, as well, number of total S&T personnel from 2010 to 2011 are replaced by number of R&D personnel.

## 3 Evaluation of Regional S&T Innovation Capability

### 3.1 Analysis method

Factor analysis method is one of the important methods of multivariate statistical analysis. Its basic idea is to distill variables with complicated relationship to several hypothetical variables (i.e. factors) by studying the inner structure of multivariable correlation coefficient matrix. These supposed variables could reflect the major information of original observed variables and explain interdependency relationship among all these observed variables. On owning large amounts of data, factor analysis could be an ideal evaluation tool of comprehensive evaluation study on regional innovation capability. The paper sets variance contribution ratio of various factors as weight, and then uses weighted average method to calculate column vectors of factor score coefficient matrix and finally obtain column vectors of integrate score. According to the integrate score, the paper evaluates the regional S&T innovation capability.

### 3.2 S&T innovation capability

On the basis of statistical data of 2009, the paper calculates the data by factor analysis. Similarly, statistical data of other years are analyzed in the same way. So, they are omitted.

KMO and Bartlett's test of Sphericity

Before analysis, test of factor analysis should be conducted first, or the analysis maybe mindless. The paper uses SPSS 19 to conduct the test. The result shows that, value of measure of sampling adequacy is 0.738, higher than 0.5. The statistic of Bartlett's test is 731.633, high enough to conduct

factor analysis. Its corresponding P-value (i.e. Sig.) is 0.000, lower than 0.05, that it to say, it can refuse the original suppose that partial correlation coefficient equals 0 and correlation coefficient matrix is identical matrix. In brief, the data can be calculated by factor analysis.

### 3.3 Model calculation

The paper conduct the factor loading evaluation of original observed data of 13 variables (13×30) in Table 1 by using SPSS 19 and factor analysis method, to gets eigenvalue of correlation coefficient matrix and variance contribution ratio (Table 2); and then find out the principal factors based on the principle of eigenvalue higher than 1. Thus, thirteen original variables are converted to three integrated variables (i.e. principal factors).

Table 2 reveals that eigenvalues of first three factors are all higher than 1. Of which, eigenvalue of the first factor is 8.671, explaining 66.702% of thirteen original variables total variance; eigenvalue of the second factor is 1.789, explaining 13.762% of thirteen original variables total variance; eigenvalue of the third factor is 1.020, explaining 7.843% of thirteen original variables total variance. Their cumulative variance contribution ratio is 88.306%. Namely, these three factors cumulatively explain 88.306% of information reflected by original data. Therefore, it is scientific and reasonable to draw first three principal factors (F<sub>1</sub>, F<sub>2</sub>, F<sub>3</sub>).

**Table 2 Eigenvalue of Correlation Coefficient Matrix, Variance Contribution Ratio and Cumulative Variance Contribution Ratio**

Component	Before Rotation			After Rotation		
	Total	Variance contribution ratio (%)	Cumulative Variance contribution ratio (%)	Total	Variance contribution ratio (%)	Cumulative Variance contribution ratio (%)
1	8.671	66.702	66.702	5.353	41.176	41.176
2	1.789	13.762	80.463	3.793	29.174	70.350
3	1.020	7.843	88.306	2.334	17.956	88.306

In order to make the principal factors have obvious meaning, factor loading matrix is needed to be rotated orthogonally, which could make each original variable loading on principal factors divide into 0 and 1, make factor structure simple. Further, practical meaning of each principal factor can be explained more obviously. Here, we use varimax method to rotate it three times and get eigenvalue, contribution ratio and loading matrix (omitted) of principal factors (Table 2). Of which, variance rotation contribution ratio can be used as weights in the calculation of principal factors' integrated scores afterwards.

### 3.4 Results analysis

Since values of principal factors cannot be observed directly, authors hope to describe variation characteristics and horizontal differentiation of principal factors through detailed original data. The paper uses the relationship between principal factors and original variables, adopt regression method to evaluate score coefficient matrixes of 3 principal factors (i.e. FC<sub>i</sub>). (Table 3)

**Table 3 Coefficient of Principal Factor Score**

Std. variable	Score Coefficient			Std. variable	Score Coefficient		
	FC <sub>1</sub>	FC <sub>2</sub>	FC <sub>3</sub>		FC <sub>1</sub>	FC <sub>2</sub>	FC <sub>3</sub>
Z <sub>1</sub>	0.289	-0.019	-0.288	Z <sub>8</sub>	0.166	-0.049	0.045
Z <sub>2</sub>	0.260	-0.261	0.107	Z <sub>9</sub>	0.013	0.048	0.174
Z <sub>3</sub>	0.044	0.380	-0.397	Z <sub>10</sub>	-0.077	0.305	-0.051
Z <sub>4</sub>	0.210	0.023	-0.153	Z <sub>11</sub>	-0.105	-0.176	0.529
Z <sub>5</sub>	0.176	-0.051	0.028	Z <sub>12</sub>	-0.191	0.394	-0.020
Z <sub>6</sub>	-0.008	-0.021	0.294	Z <sub>13</sub>	-0.127	0.065	0.365
Z <sub>7</sub>	0.107	0.042	0.031				

In addition, the covariance of scores of three principal factors between arbitrary two factors is 0. In other words, scores of three principal factors are independent each other. Therefore, collinearity problems could be completely ignored when they are used to calculate integrated scores.

Based on Table 3, observed values of standardized variables can be taken into equation (1). Then,

principal factors' scores of various regions ( $FS_1, FS_2, FS_3$ ) can be calculated.

$$FS = FC^T \times Z \quad (1)$$

In which,  $FS = (FS_1, FS_2, FS_3)^T$  is principal factors' score vector of various regions;  $Z = (Z_1 Z_2 Z_3 \dots Z_{13})^L$  is vector of standardized variables,  $FC^T$  is transposed matrix of principal factors' score coefficient matrix.

Based in equation (1), the paper takes variance rotation contribution ratio of principal factors as weights, gets integrated scores (CS) of regional S&T innovation capability. The equation is listed as follows:

$$CS = 0.4663 \times FS_1 + 0.3304 \times FS_2 + 0.2033 \times FS_3 \quad (2)$$

From equation (2), it can be got that score of first principal factor occupies 47% of integrated score weight, while the second occupies 33%, the third occupies 20%. Thus, scores and integrated scores of principal factors of 30 provinces can be calculated. (Table 4)

**Table 4 Principal Factor Score and Integrate Score of Regional S&T Innovation Capability**

Region	$FS_1$	$FS_2$	$FS_3$	CS
Beijing	-0.4660	4.7416	0.3741	1.4253
Tianjin	-0.6981	-0.3832	1.1340	-0.2215
Hebei	0.3927	-0.3657	-0.8745	-0.1155
Shanxi	-0.1599	0.2006	-1.0850	-0.2289
Inner Mongolia	-0.6404	-0.1955	-0.5345	-0.4719
Liaoning	0.4806	0.4482	-0.6181	0.2466
Jilin	-0.8775	-0.5463	1.4047	-0.3040
Heilongjiang	-0.1458	0.5728	-1.2229	-0.1274
Shanghai	-0.4431	1.1107	2.9412	0.7584
Jiangsu	2.6118	-0.2844	0.5431	1.2343
Zhejiang	1.6798	-0.9428	0.9479	0.6645
Anhui	0.2395	-0.3255	-0.3805	-0.0732
Fujian	0.1041	-0.405	-0.1151	-0.1087
Jiangxi	-0.1290	-0.2040	-0.7605	-0.2822
Shandong	1.6782	0.2416	-0.6361	0.7330
Henan	0.7696	-0.3014	-0.7654	0.1037
Hubei	0.5647	0.3605	-0.9029	0.1988
Hunan	0.2647	-0.2394	-0.0541	0.0333
Guangdong	2.2495	0.0169	1.7335	1.4070
Guangxi	-0.4930	-0.3633	-0.0952	-0.3693
Hainan	-1.1423	-0.4898	-0.1383	-0.7226
Chongqing	-1.0345	-1.0101	1.9753	-0.4144
Sichuan	0.3987	0.1412	-0.5143	0.1280
Guizhou	-0.7527	-0.3820	-0.3135	-0.5409
Yunnan	-0.5644	-0.2042	-0.5685	-0.4462
Shaanxi	0.1074	0.2125	-0.7550	-0.0332
Gansu	-0.8159	-0.0422	-0.4819	-0.4924
Qinghai	-1.2674	-0.6042	0.2036	-0.7492
Ningxia	-1.2098	-0.6790	0.3013	-0.7272
Xinjiang	-0.7015	-0.0785	-0.7425	-0.504

#### 4 Study on the Relationship Between Regional S&T Innovation Capability and

## Export of High-Tech Products

### 4.1 Integrated score of regional S&T innovation capability and regional GRP

Innovation capability of China's 30 provinces has significant difference; in the same, export regional of high-tech products is imbalance. (Figure 1) But obviously, they exist a certain correlation relationship. Statistical data of export of regional high-tech products is based on China Statistical Yearbook on Science and Technology.

### 4.2 Correlation study on regional S&T innovation capability and export of high-tech products

The paper uses several different models to analyze and test the correlation between quantitative indexes of regional S&T innovation capability (CS) and export values of regional high-tech products in continuous years. (Table 5)

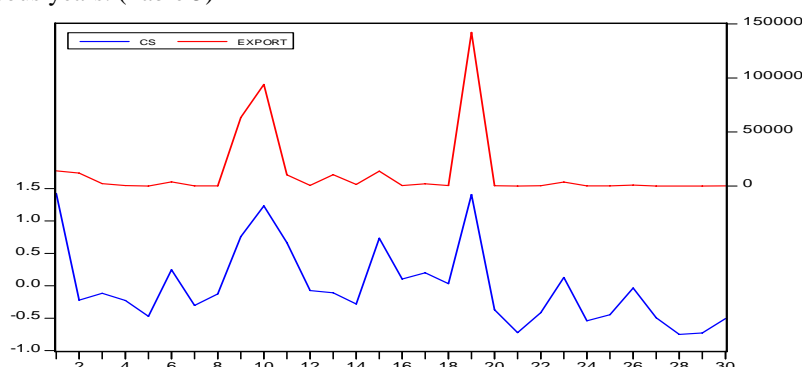


Figure 1 Regional S&T Innovation Capability and Export of High-Tech Products of China's 30 Provinces in 2009

Form Table 5, it can be revealed that correlation coefficients of six models adopted above are all positive, and also relatively higher; additionally, in terms of F statistic and Sig. (i.e. P-value), they all pass the significance test. In other words, it can explain that regional S&T innovation capability and export of high-tech products have significant linear and nonlinear positive correlation relationship and the relationship is stable. Regional S&T innovation capability plays a tremendous role in promoting export of high-tech products (process omitted).

Table 5 Indexes of Regional S&T Innovation Capability (CS) and Correlation Coefficient of Export of High-Tech Products (2005 - 2010)

Model	Linear			Quadratic			Cubic		
	R	F	Sig.	R	F	Sig.	R	F	Sig.
2005	0.617	17.195	0.000	0.617	8.298	0.002	0.783	13.749	0.00
2006	0.68	24.041	0.000	0.695	12.599	0.000	0.746	10.862	0.00
2007	0.504	9.546	0.004	0.571	6.518	0.005	0.82	17.781	0.00
2008	0.728	31.559	0.000	0.839	32.149	0.000	0.867	26.264	0.00
2009	0.714	29.104	0.000	0.787	21.947	0.000	0.787	14.092	0.00
2010	0.717	29.692	0.000	0.746	16.892	0	0.772	12.771	0.00
Model	Compound			Growth			Exponential		
	R	F	Sig.	R	F	Sig.	R	F	Sig.
2005	0.821	58.041	0.000	0.821	58.041	0.000	0.821	58.041	0.00
2006	0.867	84.918	0.000	0.867	84.918	0.000	0.867	84.918	0.00
2007	0.749	35.836	0.000	0.749	35.836	0.000	0.749	35.836	0.00
2008	0.864	82.793	0.000	0.864	82.793	0.000	0.864	82.793	0.00
2009	0.855	76.020	0.000	0.855	76.020	0.000	0.855	76.020	0.00
2010	0.811	53.989	0.000	0.811	53.989	0.000	0.811	53.989	0.00

### 4.3 Study on Regional S&T Innovation Capability Contributing to Export of High-Tech Products

The paper selects four models from six models, and takes indexes of regional S&T innovation

capability (CS) as explanatory variables, takes export values of regional high-tech products (EXPORT) as explained variables. Based on the statistical data, authors respectively establish 4 different econometric models. (Table 6 & Table 7) Of which,  $R=0.714$  or  $R=0.855$ , which shows that variables have strong linear or nonlinear positive correlation relationship; while the result of analysis of variance (ANOVA) shows that, F statistic and corresponding Sig. (i.e. P-value) of four models all explain that four models all pass the integral test, in other words, linear or nonlinear relationship among variables in models is significant; its corresponding T statistic and Sig.(i.e. P-value) respectively explain that parameters of explanatory variables CS in various models all pass the test, in other words, explanatory variables CS and explained variables Y actually have significant linear or nonlinear relationship.

**Table 6 Variance Analysis (2009)**

Model	Sort	Sum of squares of deviations	df.	Variance	F	Sig.
Linear	Regression	1.482×1010	1	1.482×1010	29.104	0.000
	Residual	1.425×1010	28	5.090×108		
	Total	2.907×1010	29			
Compound	Regression	152.748	1	152.748	76.020	0.000
	Residual	56.261	28	2.009		
	Total	209.009	29			
Growth	Regression	152.748	1	152.748	76.020	0.000
	Residual	56.261	28	2.009		
	Total	209.009	29			
Exponential	Regression	152.748	1	152.748	76.020	0.000
	Residual	56.261	28	2.009		
	Total	209.009	29			

For the statistics data of other years in 2005-2010, the paper also establishes models, and all the statistical data pass the F-test and T-test of independent variable coefficient of variance analysis. So, similar processes are omitted here.

**Table 7 Evaluate and Test of Coefficient (2009)**

Model		Coefficient	Std. Error	T	Sig.
Linear	CS	37263.121	6907.195	5.395	0.000
	(C)	12564.167	4119.225	3.050	0.005
Compound	CS	43.977	19.084	2.304	0.029
	(C)	857.023	221.798	3.864	0.001
Growth	CS	3.784	0.434	8.719	0.000
	(C)	6.753	0.259	26.095	0.000
Exponential	CS	3.784	0.434	8.719	0.000
	(C)	857.023	221.798	3.864	0.001

The paper takes linear model, the simplest model as example, establishes econometric model. That is to say, Y is export values of regional high-tech products (EXPORT) and CS is indexes of regional S&T innovation capability.

Based on the analysis above, the paper uses SPSS 19 to conduct regression analysis. (Table 6 & Table 7) Suppose that we take statistical data of year 2009 as example, by means of linear model analysis, when the index of regional S&T innovation capability increase 1%, export value of regional

high-tech products will increase 37.263 billion RMB.

## 5 Conclusions

Based on the research before, in order to avoid the one-sidedness of selecting direct indexes as S&T innovation indexes, the paper objectively and comprehensively evaluates S&T innovation capability of China's 30 provinces synthetically by means of factor analysis method according to statistical data during year 2005 to 2010. And then empirically analyze the relationship between S&T innovation capability and export of high-tech products for several consecutive years by means of correlate and regression analysis method. The analysis result shows that S&T innovation capability and export of high-tech products of China's provinces have significant difference while their correlation extent is high and their correlation relationship is stable. In conclusion, the increase of regional S&T innovation capability plays a remarkable on the rapid increase of export of regional high-tech products.

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## The Economic Dynamic Efficiency in China based on DEA-Malmquist

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**Abstract:** The article analyzed total factor productivity growth and returns to scale based on the DEA-Malmquist index decomposition method with the 1994-2009 years of various regions of China's 30 provinces and municipalities directly under the central government panel data by using software to MAXdea over the input-output efficiency. The results found that since 94, China has seen rapid TFP growth and stability of the characteristics of the volatility coexist, 2001 and 2004 are two troughs, 2003 is a wave, TFP between 1994 and 1997 was in the steady growth of 2% TFP, it began to seen a rapid TFP growth slowing from 1997 to 2005, and in 2002 years later appeared negative growth; 2005-2009, TFP had a steady growth, the scale diminishing returns degree moderate, technological progress is more steady, technical efficiency improved. In the district difference analysis percentile in accordance with the method of classification index TFP, found that the traditional and different regions, such as the western Xinxiang province of Shanxi, should belong to the regions TFP higher. Its returns to scale and technical efficiency is relatively high, it is necessary to increase investment in these areas of inputs for better output.

**Key words:** DEA-Malmquist; MAXdea; Economic dynamic efficiency ;District difference analysis

### 1 Introduction

In order to improve the quality of economic growth, the transformation of economic development is an important goal and strategic initiatives of the implement of the scientific concept of development during the "12th Five-Year" period. However, the measurement of the efficiency of economic growth is important in the analysis of quality of economic growth, it's the basement for quality of economic growth from qualitative analysis to quantitative analysis. Now the research most forus on the overall national level, or alone as a research object to certain provinces, to carry out the evaluation and judgment of the efficiency levels of economic growth, regardless of a comprehensive measure of the efficiency of state of China and the region's economic growth. The paper departed from the analytical framework of economic growth efficiency, used Malmquist Index approach to avoid the subjectivity in ascertaining weights based on data envelopment analysis to measure the efficiency of economic growth in China and the regions between 1994-2009, two aspects of efficiency change and technological change timing evolution and differences in the evaluation and inter-regional, evaluated and the efficiency change and technological change of economic growth in provinces and the regions between 1994-2009 and measured the inter-regional timing of evolution and variance analysis.

### 2 Research Methods, Indicator Selection and Data Sources

#### 2.1 Research methods

Data envelopment analysis (for short DEA) method was originally proposed in 1978 by Charnes, and then gradually developed and matured, widely used in the field of social sciences such as mathematics, operations research, mathematical economics and management science. The method defined evaluation unit as a decision making unit (DMU), determined effective production frontier of the decision-making unit through linear programming, and thus the distance of each DMU and the efficient production frontier, to determine the effectiveness of each DMU. For the character of no need to presuppose a specific production function, does not require pre-estimated parameters, avoids subjective factors and simplified algorithm to reduce the error, DEA has been widely used in evaluating the efficiency of each system to evaluate the multi-input multi-output problems. Between DEA classic models, the paper used the most mature and most basic non-Archimedean infinitesimal C2R model.

As follows: suppose there are  $n$  decision making units:  $DMU_j (1 \leq j \leq n)$ , each decision making unit has  $m$  inputs and  $s$  outputs:

$$X_j = (x_{1j}, x_{1j}, \dots, x_{1j})^T \quad j = 1, \dots, n$$

$$Y_j = (y_{1j}, y_{1j}, \dots, y_{1j})^T \quad j = 1, \dots, n$$

Given the weight of each input, output:

$$V = (v_1, v_2, \dots, v_m)^T$$

$$U = (u_1, u_2, \dots, u_m)^T$$

Unit efficiency evaluation phase should be defined as:

$$h_j = u^T y_j / v^T x_j$$

Now we evaluate the efficiency of  $J_0$ . Its input, output vector:  $(x_j, y_j)$ , for short:  $(x_0, y_0)$ , by selecting the appropriate weight:  $u_j, v_j$ , to make the efficiency evaluation maximus on condition of less than 1, So constructed multi-objective programming model as follows:

$$\begin{aligned} \max Z &= u^T y_0 / v^T x_0 \\ \begin{cases} \frac{u^T y_0}{v^T x_0} \leq 1 \\ u \geq 0, v \geq 0 \end{cases} \end{aligned} \tag{1}$$

(1) is a fractional programming, it means the proportion of output and input for DMU<sub>0</sub> reach maximum on condition that other DMU remain. By using Char-ness-Cooper transformation, BP planning theory and convexity, cone, invalidity and minimal axiom assumes the introduction of the concept of non-Archimedean infinitesimal, the above equation can be transformed into the following model:

$$\begin{aligned} \min Z &= \theta - \varepsilon(e^{\wedge T} s^- + e^T s^+) \\ \begin{cases} \sum_{j=1}^n \lambda_j x_j + s^- = \theta x_0 \\ \sum_j \lambda_j y_j - s^+ = y_0 \\ \lambda, s^+, s^- \geq 0 \\ e^{\wedge T} = (1, \dots, 1)^T \in R^m, e = (1, \dots, 1)^T \in R^s \end{cases} \end{aligned} \tag{2}$$

We define  $\varepsilon$  as Non-Archimedean infinitesimal,  $s^-$  as slack variable vector corresponded with input,  $s^+$  as slack variable vector corresponded with output, then we seeked the optimal solution  $\theta^*, \lambda^*, S^{*-}, S^{*+}$ .

The basic conclusion:

- (1)  $\theta^* = 1$ , DMU<sub>0</sub> is Weak DEA;
- (2)  $\theta^* = 1$ , and each optimal solution  $S^{*-} = S^{*+} = 0$ , then DMU<sub>0</sub> is DEA efficient;
- (3) For the non-effective DMU<sub>0</sub>, its projection of the industry production frontier surface:

$$\begin{aligned} X'_0 &= \theta^* X_0 - S^{*-}, \\ Y'_0 &= Y_0 + S^{*+} \end{aligned}$$

Above is the basic DEA method C2R model, constant returns to scale model. If the introduction of  $\sum \lambda_j = 1$  constraint, we can get another DEA model BC2 model, the variable returns to scale model.

The efficiency of C2R obtained is technical efficiency, the efficiency obtained by the BC2 is the pure technical efficiency. For Technical efficiency = pure technical efficiency  $\times$  scale efficiency. The paper used C2R model.

### 2.2 Indicator selection

Domestic application of the Malmquist index method, most of them follow the Fare and other people's ideas, there are some inadequacies in terms of index decomposition. So the article briefly reviewed the Malmquist index method, accurate interpreted the index decomposition. On the other side, This article also used the 30 provinces data of total factor productivity (TFP) changes in cross-section data in China, tied to analysed the trends and causes of economic growth in China's regional analysis. Sichuan Province included Chongqing were analyzed for the same diameter.

According to Fare, etc., the Malmquist index of output direction, which technical referred to  $s$  time and  $t$  time is defined as:



$$M_{st} = \left[ \frac{D_0^s(x_t, y_t)}{D_0^s(x_s, y_s)} \times \frac{D_0^t(x_t, y_t)}{D_0^t(x_s, y_s)} \right]^{\frac{1}{2}} = \frac{D_0^t(x_t, y_t)}{D_0^s(x_s, y_s)} \times \left[ \frac{D_0^s(x_t, y_t)}{D_0^t(x_t, y_t)} \times \frac{D_0^s(x_s, y_s)}{D_0^t(x_s, y_s)} \right]^{\frac{1}{2}} = Ech \times Tch$$

$Ech = D_0^t(x_t, y_t) / D_0^s(x_s, y_s)$  means efficiency change from time s to t.

$Tch = \left[ \frac{D_0^s(x_t, y_t)}{D_0^t(x_t, y_t)} \times \frac{D_0^s(x_s, y_s)}{D_0^t(x_s, y_s)} \right]^{\frac{1}{2}}$  means technological change from time s to t.

The Malmquist index can be decomposed into technical efficiency change (Ech) and technical change (Tch) under the assumption that constant returns to scale.

When  $M_{s,t} > 1$ , TFP improved; when  $M_{s,t} < 1$ , TFP regressed; when  $M_{s,t} = 1$ , TFP remained. When Efficiency change or technological change is greater than 1, that it is the source of TFP growth; the contrary, the source of TFP reduced.

**2.3 Data sources**

The basic data used by the DEA model in this article comes mainly from the China Statistical Yearbook "and" China's Regional Economic and Statistical Yearbook (1994-2009). Analysis of the samples used for the input and output data of the 1994-2009. The article defines the input index consists of two parts of the capital and labor, and capital to represent the actual completion of a fixed period of the regions total capital investment; labor to the city in each period by the end of registration of employment the total number of measure. Output indicators to the regional GDP. Indicators with price factors are adjusted to the relevant price index with 1994 as the base period.

**3 Empirical Analysis**

According to the above input-oriented DEA-the Malmquist index approach, we used SPSS, MAXdea software and years 1994-2009 regional economic aggregate data on the regional input-output ratio and TFP measure, analyze the dynamic efficiency of economic growth and regional differences in analysis. Ech on behalf of Efficiency Change; Tch on behalf of Technology Change; Pch on behalf of Pure Technology Change; Sch on behalf of Returns to Scale Change; TFP on behalf of Total Factor Productivity.

**3.1 Dynamic Timing evolution of total factor productivity**

It can be seen from Figure 1 and Table 1 that China's TFP has the Characteristics of volatility and smooth coexistence since 1994 so far. The year of 2001 and 2004 are two trough, and 2003 is a crest. So the time from 1994 to 2009 can be divided into three stages:

1994-1997, TFP had a steady growth with a rapid more than 2%. This period, TFP progress is mainly due to the acceleration of the process of opening up international trade and FDI levels to substantially increase. Even, International trade and FDI is conducive to China to learn advanced technology from the Western countries. This period of technological progress to increase substantially was the main driving force of the TFP growth. However, due to the market economy and modern enterprise system reform to promote the slow economic entities independent initiative is still subject to certain restrictions, technical efficiency can not be effectively enhanced, but a certain downward trend. However, during this period the degree of decreasing returns to scale to reduce TFP growth, a favorable condition to resume.

1997-2005, The growth of TFP continued but slow, and after 2002 a negative growth. In 1997 Southeast Asian financial crisis happened, in order to ensure the economic growth rate the central government, increased investment, Also the local government driven by GDP growth, constantly improved the level of investment, and local protection policy, redundanted construction. The reform of the financial system is also delayed in progress, but also makes our financial efficiency can not effectively be enhanced. Thus making this period of technical efficiency decline.

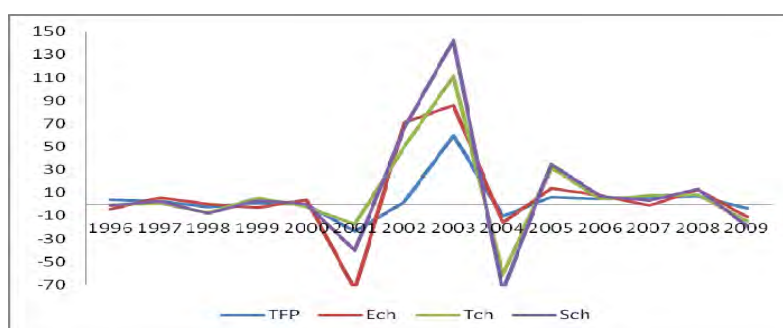
2005-2009, TFP steady grewed, the degree of decreasing returns to scale became slow and technological progress was relatively stable, technical efficiency improved.

**Table 1 Average Malmquist Index of China's Economy Efficiency**

years	Ech	Tch	Pch	Sch	TFP
1994-1995	1.023	1.075	1.025	0.998	1.100
1995-1996	0.941	1.111	0.948	0.992	1.045
1996-1997	0.972	1.054	0.961	1.012	1.025

1997-1998	1.003	0.971	0.999	1.004	0.974
1998-1999	0.963	1.051	0.985	0.978	1.013
1999-2000	1.008	0.985	1.009	0.999	0.993
2000-2001	0.496	1.545	0.644	0.770	0.766
2001-2002	0.840	1.210	0.940	0.893	1.016
2002-2003	1.061	1.517	0.908	1.169	1.609
2003-2004	1.005	0.823	1.001	1.003	0.827
2004-2005	1.084	0.970	1.051	1.032	1.052
2005-2006	1.120	0.937	1.060	1.057	1.049
2006-2007	1.047	1.014	1.041	1.006	1.062
2007-2008	1.112	0.965	1.054	1.054	1.073
2008-2009	1.035	0.926	1.029	1.005	0.958
Average	0.966	1.061	0.971	0.995	1.025

Source:according to China Statistical Yearbook and analysis by MAXdea.



**Figure 1 TFP Growth Rate and Decomposition**

Source:according to China Statistical Yearbook and analysis by MAXdea.

### 3.2 Total factor productivity analysis of regional disparities

For the change of China's TFP region mostly according to the China Statistical Yearbook on the northeast, east, central and western division. However, the article discussed that there is a certain irrationality in accordance with such zoning changes in the TFP region.

**Tabel 2 TFP Changes and Decomposition of the Various Provinces of China**

Regions	ECH	Tch	Pch	Sch	TFP
Beijing	0.978	1.117	0.979	0.999	1.093
Tianjin	0.995	1.133	1.000	0.995	1.127
Hebei	0.974	1.032	0.970	1.003	1.005
Liaoning	0.998	1.060	0.997	1.001	1.058
Shanghai	1.000	1.089	1.000	1.000	1.089
Jiangsu	1.000	1.060	1.000	1.000	1.060
Zhejiang	1.015	1.076	1.012	1.003	1.092
Fujian	0.993	1.063	0.995	0.998	1.056
Shandong	0.996	1.031	0.997	0.999	1.027
Guangdong	0.995	1.037	1.000	0.995	1.032
Guangxi	0.911	1.089	0.913	0.997	0.991
Hainan	0.934	1.114	0.976	0.957	1.041
Shanxi	0.948	1.043	0.950	0.998	0.989
Neimenggu	0.993	1.033	0.993	1.000	1.025
Jilin	0.952	1.098	0.959	0.993	1.046

Heilongjiang	0.929	1.049	0.931	0.997	0.974
Anhui	0.933	1.063	0.936	0.997	0.992
Jiangxi	0.936	1.050	0.939	0.997	0.982
Henan	0.939	1.058	0.937	1.002	0.993
Hubei	0.982	1.058	0.981	1.000	1.039
Hunan	1.004	1.110	1.003	1.001	1.115
Sichuan	0.917	1.055	0.920	0.997	0.967
Guizhou	0.921	1.076	0.929	0.991	0.991
Yunan	0.942	1.043	0.947	0.995	0.983
Xizang	0.971	1.018	1.000	0.971	0.988
Shanxi	0.963	1.052	0.965	0.998	1.013
Gansu	0.947	1.057	0.955	0.991	1.001
Qinghai	0.964	1.017	0.984	0.980	0.981
Ningxia	0.976	1.012	0.988	0.988	0.988
Xinjiang	0.976	1.053	0.981	0.994	1.027
Average	0.966	1.061	0.971	0.995	1.025

Source: according to China Statistical Yearbook and analysis by MAXdea.

As shown in Table 2, both the TFP efficiency such as Shaanxi, and Xinjiang in the western areas with high rate, middle like in Henan of TFP efficiency is relatively low provinces. Simple zoning in accordance with the location can not be a true reflection of changes in total factor productivity of the region China each region. This article in accordance with the TFP using the quantile method to the country's 30 provinces, divided into three categories. That is, first obtain the mean of the 30 provinces of the country TFP TFP is greater than the mean TFP higher regions; seek the remaining other provinces TFP mean, divided into two classes. Classification and statistical characteristics as shown in the table below:

**Table 3 The TFP Strength of Regional Classification and Statistical Characteristics**

TFP Rate	TFP with high rate	middle rate	low rate
	Beijing, Tianjin, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan, Jilin, Hubei, Hunan, Xinjiang	Hebei, Guangxi, Neimenggu, Anhui, Henan, Guizhou, Shanxi, Gansu	Shanxi, Heilongjiang, Jiangxi, Sichuan, Yunnan, Xizang, Qinghai, Ningxia
Average	1.064	1.001	0.981
S.D	0.033	0.012	0.008
Max	1.127	1.025	0.989
Min	1.027	0.991	0.967
Regions	14	8	8

Source: according to China Statistical Yearbook and analysis by MAXdea.

From the mean point of view, the gap of TFP between areas with high rate and medium rate is larger, but smaller between medium region and lower region, standard deviation of higher TFP region is relatively large, indicating that despite the TFP areas with high efficiency to be more advanced, but its internal output into the efficiency difference is more obvious because of technical progress and returns to scale, for example, technological advances such as Beijing's index is 1.117, while Ningxia only 1.012. TFP medium regions and areas of low standard is relatively small, indicating that these two regions are the internal differences in the trend of shrinking.

In addition, the regions' returns to scale with higher TFP are less than 1, indicating that the window of sustained and large investment in increasing returns to scale has closed, additional input should be reduced in these areas in order to avoid input redundancy, regions with lower TFP, the general returns to scale is higher, and indicated invest shortcomings. As shown in Table 4, Yunnan, 1994-2009, the technological progress index is 1.043, increasing returns to scale, investment in fixed asset investment and employment, respectively, as is shown insufficient

**Tabel 4 Yunnan 1994-2009 TFP Evaluation Results**

Results for firm:		Yunnan	
Technical efficiency = 1.043			
Scale efficiency = 0.995 (irs)			
variable		radial movement	slack movement
output	1	0	0
input	1	-67.503	0
input	2	-447.794	0

Source: according to China Statistical Yearbook and analysis by MAXdea.

#### 4 Conclusion

In the efficiency of economic growth, because this category contains a very complex content and belong to a normative value judgments, there are greater difficulties in making quantitative analysis of articles starting from the DEA-Malmquist Index, through the TFP indextiming changes and inter-regional study the dynamic efficiency of economic growth between 1994-2009, around the interval of the difference analysis.

Overall, the articles used panel data to reasonably reflected the timing of changes in economic growth, carved of dynamic efficiency changes in the 1994-1997 and TFP maintained a 2% growth in this period mainly due to the acceleration of the process of opening, increased dramatically, meantime during this period technological progress was the main driving force of the TFP growth. However, due to the market economy and modern enterprise system reformed slowly, independent activity of economic entities are still subject to certain restrictions, technical efficiency can not be effectively enhanced, but a certain downward trend; from 1997 to 2005, the Southeast Asian financial crisis happened and TFP growth began to slow down, even a negative growth after 2002; 2005-2009, TFP, maintained a steady growth and returns to scale decreased stable, technological progress, technical efficiency has improved.

From the regional point of view, the quantile method reasonable partitioned the country according to the TFP index, avoided the tradition geographical zoning but not a true reflection of changes in total factor productivity of the regions in China. The conclusions in the empirical analysis also confirmed that as shown in Table 3, the technical efficiency of Xinjiang in China is 1.053, increasing returns to scale is 0.994 while TFP is 1.027, obviously belongs to the TFP higher regions, while in the traditional classification, Xinjiang in China is often listed into the western region, resulting in the data analysis process standard deviation is too large, even affected the results.

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# A Game Model Between Governments and Enterprises in the Green Supply Chain of the Home Appliance Industry

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**Abstract:** Green supply chain management is a kind of effective management approach for home appliance industry to pursue the strategy of sustainable development and improve the product international competitiveness. In this paper, a game model is proposed to study the relationship and game status between governments and enterprises in the green supply chain of the home appliance industry. Through the equilibrium analysis of the game model, some countermeasures are put forward, which can be helpful to improve the construction of the green supply chain in the home appliance industry.

**Keywords:** Green supply chain; Home appliance industry; Governements; Enterprises; Static games of complete information; Nash equilibrium

## 1 Introduction

Since the beginning of the 21st century, to protect the ecological environment and realize sustainable development has become a topic of common concern around the world. In recent years, many countries in the world formulate more strict environmental protection laws and regulations to strengthen the environmental protection and management.

WEEE directive 2002/96/EC (Waste Electrical and Electronic Equipment, as amended by 2003/108/EC) and RoHS directive 2002/95/EC (Restriction of Hazardous Substances) are two important regulations relating to household electrical and electronic equipment used by consumers. The objective of the WEEE directive is to improve the level of environmental protection within the European Union through the reduction of waste from household electrical and electronic equipments. Equipment producers are responsible for the management of takeback and disposal of waste starting from 13 August 2005. The RoHS directive aims at harmonization of the legislation in the EU Member States on the restriction of the use of hazardous substances in household electrical and electronic equipment. The general rule is that equipment containing a certain level of lead, mercury, cadmium, hexavalent chromium, PBB's and PBDE's may not be placed onto the market after 1 July 2006. As the main country of manufacturing and exporting home appliances, China will be seriously affected by these regulations. Therefore, there is no time to delay for Chinese home appliance industry to establish green supply chain, which could be with great significance to improve our product competitiveness in the international market, protect the environment and implement the strategy of sustainable development.

Green supply chain, like traditional supply chain, is a cooperative system typically needs coordination and management and may be more complex due to its diversifying components and operational objectives. Hence the mutual relationship between the main stakeholders, especially the relationship between governments and enterprises, will influence the effective implementation of green supply chain (Xu et al, 2012)<sup>[1]</sup>.

## 2 Research Status on Game Analysis of Green Supply Chain

In 1996, the National Scientific Funds (NSF) in USA provided \$400,000 financial aid to the Manufacture Research Consortium (MRC) in Michigan State University to conduct a research project named "Environmental Responsible Manufacture" and then the definition of Green Supply Chain was proposed firstly (Handfield, 1996)<sup>[2]</sup>. From then on, more and more scholars began to research the green supply chain from different perspectives. The so-called green supply chain is a kind of modern management mode which takes the environmental impact and resource efficiency into a comprehensive consideration within the entire supply chain. Taking green manufacturing theory and supply chain management technology as the foundation, it involves suppliers, manufacturers, distributors and users, with the purpose to make the environmental impact (negative effect) minimum and resource efficiency

maximum during the whole process from material acquisition, processing, packaging, storage, transportation, usage to scrapping (Dan Bin and Liu Fei, 2000)<sup>[3]</sup>. The basic objective of green supply chain management is to protect environment and make use of resources effectively.

As for game theory, in mathematics, it models strategic situations, or games, in which an individual's success in making choices depends on the choices of others (Myerson, 1991)<sup>[4]</sup>. Game theory has been widely used in many subject areas, including the field of supply chain management. Many researchers have studied supply chain coordination with contracts and proposed many game models.

However, game analysis between the participating subjects in the green supply chain is still very limit. Only a few researchers have conducted some study on the relationships by using game theory. Pantumsinchai (1992)<sup>[5]</sup> pointed out that government's support increased enterprise's economic and environmental performance, and then the enterprise further integrated and make the whole supply chain 'green'. In order to investigate the game between governments and core-enterprises in green supply chains, Zhu and Dou (2007)<sup>[6]</sup> analyzed their respective costs and benefits, and studied the game status by evolutionary game theory. Li and Liu et al (2007)<sup>[7]</sup> from the government supervision's angle, built up dynamic game models of reverse logistics by using the game theory. Xu and Zheng (2008)<sup>[8]</sup> studied the relationship between governments and corporations in green supply chain under the condition of impeaching. Cao and Wen (2011)<sup>[9]</sup> also set up a game model between governments and enterprises in green supply chain and analyzed their behavior and equilibrium strategies. There are also a few scholars having tried to conduct preliminary analysis of the multilateral game relationship between governments, enterprises and consumers in the green supply chain, e.g., Wang (2004)<sup>[10]</sup>. Yu and Liu (2011)<sup>[11]</sup>. Xu et al (2011)<sup>[12]</sup>.

Some researchers analyzed the relationship between the enterprises within green supply chain, e.g., Wang and Yan (2009)<sup>[13]</sup> analyzed the respective costs and benefits of suppliers and core-enterprise in green supply chain, and established an evolutionary game model between governments and enterprises based on evolutionary game theory. Hou and Wang (2010)<sup>[14]</sup> studied the relationship between enterprises of green supply chain and those of traditional one.

Some scholars conducted some analysis of the game relationship in the green supply chain connected with specific industries, e.g., Zhou and Zhang (2007)<sup>[15]</sup> analyzed the relationship between government, coal and electricity, Feng and Wang (2010)<sup>[16]</sup> analyzed the different intention and game action between client and general contactor in the progress of constructing green supply chain in construction industry. The authors of this paper have ever analyzed the relationship between enterprises and consumers in green supply chain of home appliance industry (Xu et al, 2011)<sup>[17]</sup>.

It can be found that the research results about the game analysis between the main stakeholders is so limit and there is no research result found about the game relationship analysis connected with the background of home appliance industry except the authors' previous study. Concerning of the pressure from the more strict environmental rules such as WEEE and RoHS, it will be essential to study the game relationship between the main stakeholders in the green supply chain of home appliance industry, which will be helpful to promote the construction and development of the green supply chain.

### **3 A Game Model between Governments and Home Appliance Enterprises**

#### **3.1 Basic assumptions and definitions**

The construction of the green supply chain of home appliance industry requires involvement of governments, enterprises, consumers and other relevant society members. In order to facilitate the analysis, here we assume that there are only two stakeholders, i.e. governments and home appliance enterprises (simply as "enterprises"). Governments refer to local governments and also include some relevant organizations or committees who focus on the environment protection and are entitled to issue some environmental regulations or rules. Enterprises refer to those who are engaged in home appliances manufacturing or sales. Meanwhile, we assume that governments and enterprises are all rational economic men, who take the benefit maximization as their goal. The players of the game know the strategies and payoffs of others. In short-term equilibrium, the game problem can be regarded as a kind of static games of complete information and to seek Nash equilibrium.

In the current market conditions with green home appliances and traditional home appliances coexist, the enterprises have two strategies: one is to offer green home appliances, e.g., home appliance manufacturers actively develop ecological design and introduce some available technologies to manufacture green home appliances, or retailers actively promote and sell the green home appliances;

the other one is to offer traditional home appliances by using traditional methods to design, manufacture and sell home appliances, and in this circumstance enterprises will be punished by governments and pay for penalty due to not meeting the requirements of environmental protection. As for governments, they can adopt the strategy of supervision, which means they will supervise whether the enterprises has deployed green supply chain management. If they find the enterprises are offering green home appliances, they give them a sum of money as subsidy. Conversely they will punish the enterprises. Governments can choose the strategy of unsupervision too, which means they will do nothing-no subsidy and no penalty.

According to existing literatures, we make some assumptions and definitions about the benefits and costs for governments and enterprises in order to determine the payoff for each player with every possible combination of actions. When enterprises choose to offer traditional home appliances,  $R_B$  and  $C_B$  respectively represent the total revenues and the total costs, and  $F_B$  represents the payable penalty to governments due to not meeting the requirement of implementing green supply chain. When enterprises choose to offer green appliances,  $R_B'$  and  $C_B'$  respectively represent the total revenues and the total costs in this case, and  $S_B$  represents the subsidy that they can obtain from governments. As for governments, except the subsidy  $S_B$ ,  $C_E$  represents the costs of supervision and  $L_E$  shows the loss of the social welfare due to the environmental disruption from the traditional home appliances.

**3.2 Payoff matrix of governments and enterprises**

Based on the above assumptions and definitions, we can construct a game model between governments and enterprises, which is represented by a payoff matrix shown in Table 1. Each player has two strategies, which are specified following the name of players. The payoffs are provided in the interior. The first number is the payoff received by governments; the second is the payoff for the enterprises.

**Table 1 Payoff Matrix of Governments and Enterprises**

		Enterprises	
		Offer Green Home Appliances ( $B_1$ )	Offer Traditional Home Appliances ( $B_2$ )
Governments	Supervision ( $E_1$ )	$-C_E - S_B, R_B' - C_B' + S_B$	$-C_E - L_E + F_B, R_B - C_B - F_B$
	Unsupervision ( $E_2$ )	$0, R_B' - C_B'$	$-L_E, R_B - C_B$

**4 Equilibrium Analysis of the Game Model between Government and Enterprises**

Now we conduct detailed equilibrium analysis of the game model proposed above.

**4.1 Pure strategy nash equilibrium**

4.1.1 If  $R_B' - C_B' + S_B < R_B - C_B - F_B$ ,

then as for enterprises, this means that the payoff of offering green appliances is less than the amount of offering traditional appliances. This condition can also be expressed in another way, i.e.,  $(C_B' - C_B) - (R_B' - R_B) - S_B > F_B$ , which means that the increased cost of offering green appliances will be greater than the penalty  $F_B$  even if have being compensated by the increased revenue and governments subsidies. Next we consider two circumstances:

(1) if  $-C_E - L_E + F_B > -L_E$ , i.e.  $-C_E + F_B > 0$ , which means the penalty governments gained from the enterprises is greater than the supervisory cost when the governments adopt the strategy of supervision, then there will be a unique pure-strategy Nash equilibrium and the stable strategies combination will be (Supervision, Offer Traditional Home Appliances). In this case, the increased cost for green home appliances is maybe too high and the penalty from the government is lesser, therefore, driven by interests, enterprises may prefer to offer traditional appliances.

(2) if  $-C_E - L_E + F_B < -L_E$ , i.e.,  $-C_E + F_B < 0$ , which means the penalty governments gained from the enterprises can not compensate the cost for supervision, hence the governments would prefer to adopt the strategy of unsupervision. Then it will be discussed further as following two circumstances.

If  $R_B - C_B > R_B' - C_B'$ , which indicates that the payoff of offering green appliances is less than the amount of offering traditional appliances and the enterprises do not need to pay for the penalty because the governments do not supervise. Then there will be unique pure-strategy Nash equilibrium and the stable strategies combination will be (Unsupervision, Offer Traditional Home Appliances).

If  $R_B - C_B < R_B' - C_B'$ , which means the payoff of offering green appliances surpasses the amount of offering traditional appliances, then the enterprises would be willing to offer green home appliances and the governments would adopt the strategy of unsupervision, thus the game has a unique pure-strategy

Nash equilibrium. The stable strategies combination is (Unsupervision, Offer Green Home Appliances). This is the ideal case, under which the enterprises are actively adopt the strategy of “Offering Green Home Appliances” and the governments do not need to supervise.

4.1.2 If  $R_B' - C_B' + S_B > R_B - C_B - F_B$ ,

then as for enterprises, this means the payoff of offering green appliances surpasses the amount of offering traditional appliances. This condition can be expressed in another way, i.e.,  $(C_B' - C_B) - (R_B' - R_B) - S_B < F_B$ , which indicates that the increased cost of offering green appliances are compensated by the increased revenue and governments subsidies and the surplus is less than the penalty  $F_B$ . In this circumstance, the enterprises would rather offer green home appliances. While the governments would adopt the strategy of Unsupervision as a rational economic men. It is obviously that the strategies combination (Supervision, Offer Green Home Appliances) will not become the pure Nash equilibrium. It should be discussed further in two cases.

If  $R_B' - C_B' > R_B - C_B$ , then there will be a unique pure-strategy Nash equilibrium and the stable strategies combination will be (Unsupervision, Offer Green Home Appliances).

If  $R_B' - C_B' < R_B - C_B$  and  $-C_E - L_E + F_B < -L_E$ , then there will be a unique pure-strategy Nash equilibrium and the stable strategies combination will be (Unsupervision, Offer Traditional Home Appliances).

If  $R_B' - C_B' < R_B - C_B$  and  $-C_E - L_E + F_B > -L_E$ , then there will be no pure-strategy Nash equilibrium and the players will choose mixed strategies.

#### 4.2 Mixed strategy equilibrium

If no pure-strategy Nash equilibrium exists, the players will choose mixed strategies, where a pure strategy is chosen at random, subject to some fixed probability. Here we assign governments the probability  $p_1$  of playing  $E_1$  (Supervision) and  $(1-p_1)$  of playing  $E_2$  (Unsupervision), assign enterprises the probability  $p_2$  of playing  $B_1$  (Offer Green Home Appliances) and  $(1-p_2)$  of playing  $B_2$  (Offer Traditional Home Appliances), where  $0 \leq p_1 \leq 1$ ,  $0 \leq p_2 \leq 1$ , then the expected revenue for governments and enterprises can be determined by the following equations.

$$E_E(p_1, p_2) = p_1[p_2(-C_E - S_B) + (1-p_2)(-C_E - L_E + F_B)] + (1-p_1)[0p_2 + (1-p_2)(-L_E)] \quad (1)$$

$$E_B(p_1, p_2) = p_2[p_1(R_B' - C_B' + S_B) + (1-p_1)(R_B' - C_B')] + (1-p_2)[p_1(R_B - C_B - F_B) + (1-p_1)(R_B - C_B)] \quad (2)$$

$$\text{Make } \frac{\partial E_E}{\partial p_1} = 0, \text{ then } p_2 = \frac{-C_E + F_B}{S_B + F_B} \quad (3)$$

$$\text{Make } \frac{\partial E_B}{\partial p_2} = 0, \text{ then } p_1 = \frac{(R_B - R_B') - (C_B - C_B')}{S_B + F_B} \quad (4)$$

In order to facilitate the analysis, another presentation of  $p_2$  is proposed as equation (5).

$$p_2 = \frac{-C_E + F_B}{S_B + F_B} = 1 - \frac{C_E + S_B}{S_B + F_B} \quad (5)$$

##### 4.2.1 Influencing factors of $p_2$

From the equation (3) and (5), it can be found that:

1)  $P_2$  is an increasing function of  $F_B$ . When  $F_B$  increases, the governments would be more willing to supervise driven by economic benefits. Meanwhile, the enterprises would be willing to offer green home appliances in order to avoid to be punished.

2)  $P_2$  is a decreasing function of  $S_B$  and  $C_E$ . The more the number of  $C_E$ , the more the unwillingness of the enterprises to offer green home appliances will be. Similarly, when  $S_B$  increases, the governments could provide more subsidy to enterprise, which will affect the governments' enthusiasm to supervise. In this circumstance, the possibility of enterprises to offer green home appliances will decrease, because they would lack of initiative due to the high expenditure for green products, and under the condition of without the governments' supervision as well.

##### 4.2.2 Influencing factors of $p_1$

From the equation (4), it can be found that:

1)  $P_1$  is an increasing function of  $R_B - R_B'$ .  $R_B - R_B'$  means the difference between the revenue of offering green home appliances and offering traditional ones. When  $R_B - R_B'$  increases, which means the



revenue for green products will decrease more ( $R_B' < R_B$ ) or increase less ( $R_B' > R_B$ ), thus the enterprises will lack of initiative to offer green home appliances. The supervision of the governments would be necessary, then  $p_1$  will increase.

2)  $P_1$  is a decreasing function of  $C_B - C_B'$ ,  $S_B$  and  $F_B$ . Normally, the non-equality  $C_B' > C_B$  exists, i.e.,  $C_B - C_B' < 0$ . Therefore when  $C_B - C_B'$  increases, the cost difference between offering green appliances and traditional ones decreases, which means there will be not too much cost increase for offering green appliances. Taking further considering of the governments penalty, enterprises would have more motive power to offer green home appliances. Similarly, when  $S_B$  and  $F_B$  increases, the enterprises would rather offer green home appliances driven by the subsidy from the governments and restricted by the penalty as well. As for governments, the possibility of supervision would be decrease due to the increasing initiative of enterprises to offer green home appliances.

## 5 Conclusions

In general, in the static game of complete information between governments and enterprises in the green supply chain of home appliance industry, there are three pure-strategy Nash equilibriums, i.e., (Unsupervision, Offer Green Home Appliances), (Unsupervision, Offer Traditional Home Appliance) and (Supervision, Offer Traditional Home Appliance). It is obvious that the solution of (Unsupervision, Offer Green Home Appliances) is what we desire. The condition is  $R_B' - C_B' > R_B - C_B$ . However, offering green home appliances requires higher level of technology and operation management. Hence the cost would be greater than offering traditional ones. At the same time, enterprises have to quote a favorable price in order to attract more consumers to accept green home appliances. Therefore, the condition is hard to accomplish in the current reality.

In the mixed strategy, through the analysis on the influencing factors of  $p_1$  and  $p_2$  by combining the governments and enterprises, it can be found that: (1) when the governments have more initiatives to supervise, the enterprise would be under the pressure and choose to offer green home appliances; (2) when the enterprises could actively adopt the strategy of green supply chain, the governments would not need to supervise. Since there are not conditions for enterprises to actively adopt the strategy of green supply chain, so it is necessary to promote the enterprises to implement green supply chain through governments' necessary supervision. In other words, the governments should play a leading role in the green supply chain management of the home appliance industry. The governments can improve the enthusiasm and possibility of enterprises to participate in green supply chain by setting appropriate subsidy  $S_B$  and penalty  $F_B$  for the case not deploying the strategy of green supply chain management.

In the long run, governments will play a very important role in the construction of green supply chain of home appliance industry. The governments should begin with improving laws and regulations about environmental protection, cultivating green price system and green market in order to create favorable external conditions to improve the construction of the green supply chain of home appliance industry. Meanwhile the role of market in the aspect of resource allocation should effectively come into play and lead the enterprises in consciously pursuing scientific management approaches and techniques of green supply chain. Only by doing so, the home appliance industry can realize sustainable development.

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# Construction on Internal Control Evaluation System in Perspective of Organization Immunity

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**Abstract:** The immune theory is introduced into the area of internal control. The connotation of specification study method is used on organization immunity and its relationship with internal control. The consistency of objectives and elements is demonstrated. The evaluation of enterprise's internal control system is design based on the connotation of organization immunity. The fuzzy hierarchy analysis method is used to construct the evaluation model of enterprise's internal control in organization immunity perspective which provides new ideas for the enterprise internal control evaluation.

**Key words:** Organization immunity; Internal control; Evaluation system; Fuzzy analytic hierarchy process

## 1 Introduction

Internal control is an important part of daily operation and management activity in enterprises, and it is also important means for enterprises to implement a comprehensive risk management. From the impact of SOX Act, countries around the world have similar specifications, requirements for internal control evaluation of listed companies. In our country, in April 2010, the Ministry of Finance and other four ministries jointly issued the "basic standard for enterprise internal control" (hereinafter referred to as the "basic standard"), and introduced a special "enterprise internal control assessment guideline", for a time, the evaluation of internal control has become a hot research problem.

At home and abroad there have been a lot of researches on the evaluation of internal control, which can be divided into two broad categories: first, the construction of evaluation system of enterprise internal control based on the five elements. EI Paso (2002) put forward the evaluation index system of internal control which contains five elements, ninety-three indicators. Shi-Ming Huang (2004) gave out 56 index evaluation of enterprise internal control based on COSO report. Chen Hanwen (2010) construct a five-level evaluation indexes of evaluation index system and expressed as an index of enterprise's internal control effectiveness according to the basic specification and its supporting guidelines, used five elements as evaluation objects. Second is target-oriented evaluation of internal control system. Wanghong, Jiang Zhanhua et (2011) prepared "Internal Control Evaluation Index of Listed Companies in China" based on orientation of internal control objectives. Zhang Zhaoguo et (2011) construct evaluation index system of internal control based on quantitative indicators and objective-oriented, and evaluate the effectiveness of a test.

As there is questioning on effectiveness of internal control evaluation based on the five elements recently, many scholars have pointed out that, the internal control evaluation based on the five elements significantly increased the cost of corporate internal control evaluation, and the effectiveness of five elements and efficiency as a whole does not correspond exactly to each other, therefore, this method can not guarantee the effectiveness of assessment. In view of this, scholars have only come up with goal-oriented evaluation system of internal control. Compared to the evaluation of five elements, goal-directed evaluation system of internal control is indeed a step forward, but internal control objectives are hierarchical in nature, is a complex system. This complexity has made many businesses not to use the evaluation system of internal control. Therefore, the theory of organizational immune evaluation on internal control is introduced, and new idea is provided to internal control evaluation for enterprise.

## 2 Connotations of Organization Immunity and its Relationship with Internal Control

### 2.1 Connotation and classification of organization immunity

In order to construct an enterprise internal control and evaluation system based on the theories of organizational immune-related, the related theory of immunity is organized, and it is analyzed that the relationship between immunity and the internal control of the organization.

In medicine, immunization refers to the body's recognition of "their" and "not", and discriminate

against those who hold different views to maintain a defense mechanism of the body's internal stability. Organization immunity refers to the ability when organizations organizing internal and external risk factors and producing memory to maintain normal functioning of the organization. Lv Ping, Wang Yihua (2009) interviewed a large number of enterprises, and divided organization immunity acts into nonspecific immune and specificity of two categories. Specific immunity is an enterprise that there is the general response planned in advance against the risk of internal and external factors. Nonspecific immunity includes the three elements of organizational structure, institutional rules and organizational culture. Organizational structure is arranged on various positions within the company as well as rights and duties of each position in a set of system, which ensures that the various departments in your organization play a role to organization goals. Institutional rule is that employees can follow clear instructions or explanations. Organizational culture is the core of the formation of attitudes and values in the development process.

Specific immunity refers to a specific response produced when nonspecific immunity cannot solve the major risk factors of acquired immunodeficiency syndrome, based on the predetermined organizational structure, institutional rules and organizational culture. Wang Yihua (2006) holds that the defense organization of nonspecific immunity includes the organization monitoring, organization defense and organizational memory into three parts. Organization monitoring refers to the identification for internal and external risk factors, which is the basis of specific immunity. Organization defense refers to the action to avoid risky behavior. Organizational memory is through the storage of past information for decision-making, in order to facilitate decision-making in the future.

To sum up, the classification of organization immunity is shown in Figure.1.

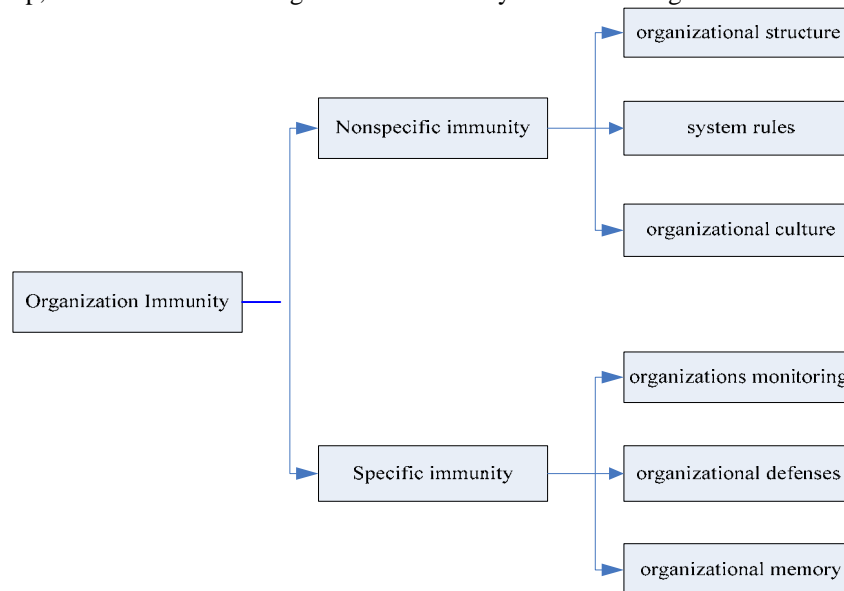


Figure 1 Classification Of Organization Immunity

**2.2 Mechanism of organization immunity**

The action of organization immunity aimed at preventing external risk within the organization so that the organization has always been in a healthy state. Nonspecific immunity is the first line of organization defense in response to internal and external risk factors. In the nonspecific immunity level, organizations need to design organization immunity system according to their own environment and the leader's willingness, including the design of organizational structures, development of system rules and evolving organizational culture, which determines the organization of "innate" immunity. Nonspecific immunity is clearly not protected from all risk factors both inside and outside the enterprise, so that specific immunity is very important. Specific immunity is conducted under the organization's role in internal and external risk factors of immune behavior, through the identification and assessment of risk, and then selecting the strategy of organization, and finally responding to risk and the formation of organizational memory. Therefore, organizations monitor, organization defense and organizational memory is a gradual process, through this process, the enterprise finally reach the ultimate objective to control the risks of the enterprise.

### 2.3 Relationship between organization immune and internal control

Organization immune contact with the internal control closely, which is the foundation of internal control evaluation based on organization immunity perspective. Contacts of organization immunity and the internal control are in the following two aspects:

(1) Consistency on the target. In 2004 COSO published “enterprise risk management-integrated framework” and as stated in it, “risk management is a process, affected by corporate board of directors, management and other staff, including internal control and its application strategy and company as a whole.” From this definition, risk management is a strategic application of internal control procedures and company as a whole, and is the expansion of internal control, which, in turn, can also be said that enterprise internal control is to control the risk at a reasonable level. At the same time, COSO also highlighted the process of risk management. From the above analysis on organization immunity, we can see that the fundamental purpose of immunity is also to risk control, and the process from nonspecific immunity to the specific immune is clearly visible and, therefore, internal control and organization immunity have the same destination.

(2) Consistency on the elements. In 1992, the COSO proposed that internal control includes the control environment, risk assessment, control activities, information and communication, monitoring, five elements, and the eight elements of the later are only the expansion of five elements. In fact, elements of COSO five parts has a high degree of consistency with each part of organization immune. Nonspecific immune belong to the scope of the control environment and the organization monitors is to risk assessment, organizational defenses is similar to control activity, and organizational memory includes reports on risk, also includes continuous monitoring of risk to the organization, which is similar to the information in the five elements of internal control and communication, and monitoring. Therefore, organization immune and internal controls have the same elements.

From this we can conclude that evaluation of internal control based on organization immunity perspective and evaluation goals and five elements of COSO internal control does not contradict, but enterprise internal control evaluation perspective based on organization immunity levels more, better able to reveal the links between elements. Therefore, construction of internal control system based on organization immunity perspective has some relevance.

## 3 Construction of Internal Control Evaluation System based on Organization Immunity Perspective

To build an internal control evaluation system for specific target-oriented and the reality of listed companies in China, there are three issues need to be addressed. First, is to build a complete evaluation index system; second, to select the appropriate evaluation methods; third, to identify specific evaluation process.

### 3.1 Selection of evaluation index

Under the analysis of organization immune and discussion of the relationship between organization immune and internal control, combining the basic specification and evaluation of guidelines, and the comprehensive risk management-integrated framework of the COSO Committee in United States, in this article evaluation of internal control is divided into three levels: the first level is the internal control evaluation ( $X$ ), which is the highest assessment index; the second level is the six indicators for your organization immunity: organizational structure ( $X_1$ ), system rules ( $X_2$ ), organizational culture ( $X_3$ ), the organization monitoring ( $X_4$ ), organization of Defense ( $X_5$ ), organizational memory ( $X_6$ ). The first three indicators belong to the nonspecific immunity, and the other three indicators are specific immunity.

1) Organizational structure ( $X_1$ ). Perfect organizational structure is a strong guarantee of enterprises to establish effective internal control system, the 12th to 15<sup>th</sup> of the basic norms in China, respectively, stressed the Board of Directors, the Audit Committee, the internal audit Agency's important role in enterprise internal control, these all belong to the category of the organizational structure. Therefore, it is set up that “establishment and duties of the Board of Directors to perform”, “establishment of the Audit Committee and its powers and responsibilities to fulfill”, “establishment of the internal audit function and the powers and responsibilities to fulfill” are three third-level indicators.

2) System rules ( $X_2$ ). Enterprise system of rule refers to the various rules and regulations. Enterprise must emphasize the importance of internal control in the system rules, and translate abstract internal control into concrete measures. And institutional rule of internal control is closely related to human resources systems, power distribution system and internal control system. First of all, internal controls, there are five major objectives, namely, strategic objectives, operational objectives, property security

goals, reports and compliance objectives, and there is no doubt that good human resources systems is the cornerstone to guaranty the achievement of the strategic objectives; Secondly, the implementation of internal control is an important issue of internal check, which involves the power of enterprise distribution system; and, finally, the enterprise's internal control system is reasonable or not are also important factors which directly affect the effectiveness of internal control.

3) Organizational culture ( $X_3$ ). There is such a presentation in the Basic Norms, "Enterprises should strengthen cultural construction, cultivate positive values and social responsibility, advocate honesty, love and dedication, innovation and team work spirit, modern management concepts, strengthen the consciousness of risk", from this we can see that organizational culture plays an important role in internal control. In conjunction with the presentation of the Basic Norms, it is select that corporate values, corporate social responsibility, and awareness of enterprise risk are three evaluation indicators.

4) Organizations monitoring ( $X_4$ ). Organization monitoring is within the scope of specific immunity, and it is also the key element to find enterprise internal control risk. Enterprise organizations' ability to monitor can be measured from the following aspects: first, the accuracy of enterprise internal control objectives. If enterprises internal control objectives are set up too high, it is likely to cause significant increase in the cost of internal control, this is incompatible with the principle of cost-effectiveness of internal control; when you set the objectives too low, you may not find internal control deficiencies that exist in the enterprise, resulting in failure of internal controls. Therefore, accurate target is particularly important for enterprise internal control. Second, the enterprise risk identification. Accurate identification of business risk is undoubtedly the vital functions of organization monitors, and enterprises should not only concern the financial situation, business processes, such as internal risk factors, should also concern about external risk factors such as economic conditions, laws and regulations. Third, the enterprise risk analysis. After risk factors are identified, enterprises should be able to analyze the severity of these risk factors, determine the focus and reflect the risk control.

5) Organizational defenses ( $X_5$ ). Organization defense is a process to respond to identified risks, it includes both specific risk response, also includes the authorization approval control, separation of incompatible functions control, budget control, control of operations analysis, performance evaluation of general risk control measures such as controlling.

6) Organizational memory ( $X_6$ ). Organizational memory is to store information in the past, for the decision-making process in the future, it also is important to the enterprise's internal control. A good business should be good at timely collection, transmission and processing of information in the past to prevent repeated the mistakes of the past in the future. Enterprises should set up specialized agencies based on past information, which can give special supervision and day-to-day supervision of the internal control in order to improve the effectiveness of internal control. Therefore, organizational memory includes information system control, information quality control, linking control, monitoring organization and monitoring activity for third-level index.

### 3.2 Choice of evaluation methods

The common evaluation methods include Delphi, AHP and fuzzy comprehensive evaluation method and BP neural network method, Data Envelopment Analysis (DEA), and so on. Due to the internal control evaluation indicators are qualitative indicators, BP neural network method and data envelopment analysis method is not applicable, and the subjectivity of the Delphi method is too strong, so we choose fuzzy evaluation methods for evaluation. Taking the target hierarchy into account, we use analytic hierarchy process method for determining indicator weight to reduce the empowering process of subjectivity.

### 3.3 Analysis of evaluation process

#### 3.3.1 Establish the target set

The target set is  $X = (X_1, X_2, X_3, X_4, X_5, X_6)$ , in which "X" is used to evaluate the strengths and weaknesses of the overall goal of internal control, and  $X_i (i=1,2...6)$  represents the sub-objective, their corresponding weight set is  $W = (W_1, W_2, W_3, W_4, W_5, W_6)$ , and  $W_1 + W_2 + W_3 + W_4 + W_5 + W_6 = 1$ .

#### 3.3.2 Set up factor set for evaluation

The factor set shall be the set of the indexes of the third-level factors in the evaluation index system. They are respectively composed of the factor set in all sub-target. Therefore, the factor set in all sub-target is  $X_i = (X_{i1}, X_{i2}, \dots, X_{ip_i})$ , in which  $i = 1,2,3,4,5,6$ ,  $j = 1,2,\dots,p_i$ ,  $p_i$  is the number of index in  $X_i$ . Their corresponding weight set is  $W_i = (W_{i1}, W_{i2}, \dots, W_{ip_i})$ , and  $W_{i1} + W_{i2} + \dots + W_{ip_i} = 1$ .

#### 3.3.3 Use AHP for index weight

Since the vary degrees of each element' influence on the evaluation system of internal control, we can use the experts' estimate method, the analytical hierarchy method and so on to determine the index

and the weight of the project in our practical work. The index weight is determined by the analytical hierarchy method in this article.

Using analytic hierarchy process empowers the main steps are: first, constructing judgment matrix  $W$  according to enterprise organization, management system, operation pattern, and then make the comparison matrix consistency test, level single sort again, finally level the sort to get indicator weights  $W=\{w_1,w_2,w_3,w_4,w_5,w_6\}$ . Simultaneously, the index weight for lower level,  $W_i=\{W_{i1}, W_{i2}, \dots, W_{ipi}\}$ , is determined.

3.3.4 Building reviews set

Enterprise internal control reviews set to  $V$ , which include level of enterprise internal control :  $A([90,100])$ ,  $B([80,90])$ ,  $C([70,80])$ ,  $D([60,70])$ ,  $E([0,60])$ . Business can choose a more complex set of reviews.

3.3.5 Establish the comprehensive evaluation matrix model

The third step of the left are attached to the fourth step of the weight vector matrix, respectively first and second-level fuzzy comprehensive evaluation, ultimate enterprise internal control according to the maximum membership grade principle is good or bad, to completing the fuzzy evaluation of enterprise's internal control.

The fuzzy evaluation matrix established from the target set “ $X$ ” to the reviews set “ $V$ ” is a calculation model which sets up the secondary-level matrix from the bottom to top based on the average scores of review grades corresponding to the secondary-level indexes:

1) Calculate and determine the evaluation value of each factor ( $V_{ij}$ ):

$$v_{ij} = \frac{\sum_{l=1}^n v_{ijl}}{n} \tag{1}$$

(Where  $i = 1,2,3,4,5,6$ ;  $j = 1,2, \dots p_i$ ; “ $p_i$ ” is the number of “ $X_i$ ” under the classification index; “ $n$ ” is the number of experts scoring the evaluation of each third-level index; “ $V_{ijl}$ ” indicates the scores given by experts), get an average score for  $V_{ij}$ , which is the evaluation value of last level.

2) Calculate and determine the evaluation value of each factor ( $V_i$ ):

$$V_i = \begin{bmatrix} w_{i1} & w_{i2} & \dots & w_{ipi} \end{bmatrix} \begin{bmatrix} v_{i1} \\ v_{i2} \\ \dots \\ v_{ipi} \end{bmatrix} \tag{2}$$

Where:  $i = 1,2,3,4,5,6$ ;  $W_{ij}$  (where  $i = 1,2,3,4,5,6$ ;  $j = 1,2, \dots p_i$ ) indicates the weights of each index in  $X_i$ ; “ $v_{ij}$ ” indicates the average scores of the corresponding reviews rating of each index in  $X_i$ .

3) Calculate and determine the comprehensive evaluation value ( $V$ ):

$$V = \begin{bmatrix} w_1 & w_2 & w_3 & w_4 & w_5 & w_6 \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \\ v_6 \end{bmatrix} \tag{3}$$

Where:  $W_i$  ( $i=1,2,3,4,5,6$ ), indicates the weight of each element in  $X_i$ ; “ $v_i$ ” is the appraisal value that has been calculated for the various elements.

**3.4 Analysis of evaluation results**

Using the model, you can get overall effectiveness of enterprise's internal control, can also be learned in organizational structure, rules, organizational culture, Organization monitoring, organization and organizational memory this defense in six parts, which have done better, what could be improved. Therefore this model can be used as reference for self-evaluation and social evaluation of enterprise's internal control, but the model is just an internal control audit of the supplement, there cannot be a substitute for internal control audit, which is limitation of the model.

## 4 Conclusion

Organization immune theory is introduced into the enterprise's internal control, and it is demonstrated that the consistency of objectives and elements between organizational immunity and internal control. Under the view of organization immunity, we build an enterprise internal control evaluation model with fuzzy hierarchy analysis. Formation mechanism and transfer paths for enterprise risk will be studied by organizational immunity, and we will continue to use the research results to further study on listed company internal control evaluation of specific measures and methods.

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## FDI Trade and Its Effects on Agricultural Development in Nigeria: Evidence from Time Series Analysis

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**Abstract:** Agricultural sector is seen as an engine that contributes to the growth of the overall economy of Nigeria, despite several government efforts the sector is still characterized with low yields and limited areas under cultivation due to government dependence on mono-agricultural economy based on oil. This study attempts to evaluate the impacts of FDI, trade and its effects on agricultural sector development in Nigeria between the periods of 1980-2009, in analyzing the variables (VAR) model was used employing a three-step procedure. The Unit root test was conducted using the Augmented Dickey Fuller (ADF) and Philips-Parron (PP). Johansen and Juselius multivariate Cointegration test indicate that there is a present of cointegration. Granger causality test result shows that the variables employed have a bidirectional relationship, unidirectional relationship and no casual relationship. It is recommended that in order to boost agricultural output and develop the sector as a whole, more FDI should not only be sourced, there is a need for the government to provide legal and administrative quality framework and encourage more exportation of agricultural output that will enhance foreign exchange earnings and improve the competitiveness of Nigeria agricultural produce in the international market.

**Key words:** Agriculture; FDI; GDP; Economic development and nigeria

### 1 Introduction

The Nigeria economic land scape have developed over the last few years as outcome of rapid phase of industrialization, therefore the economy of the country has improved tremendously due to foreign investment aided by privatization of state owned enterprise.

As a resource-rich country, Nigeria's economic performance has been unfortunately driven by the oil and gas sector to the extent that even the progress recorded towards genuine economic development prior to the discovery of oil in commercial quantity has been virtually eroded. In 2000-2005 the GDP growth of Nigeria was 5.7% and the growth in the non-oil sector, which contributed about 5.9% of the GDP. However, the oil sector provides significant role in revenue sources and foreign exchange to the country.

The decline of the agricultural sector performance was due to the fact that the Federal Government shifted its focus to oil exploration, therefore the sustainable development of the Nigerian economy should be diversified away from oil and gas to non-oil sector and it should be based on the country's abundant resource and comparative advantage. However China-Nigeria relations in recent development has presented Nigeria with both opportunities and challenges. Opportunities that could be derive from the Sino-Nigeria bilateral trade relationship could be described in many forms; prominent among them is the infrastructural development that China offers in returns for mineral resource exploration. Similarly it's expected to gain management and technical know-how, transfer of technology and boosting agricultural production of the country.

The objective of this paper is to assess the agriculture status of the country by looking at the overall development in agriculture relative to the agricultural potential of the nation and the economic cooperation between Nigeria and China in the form of FDI and trade in agricultural sector.

The paper is divided into six sections starting with review of some literatures in section 2; section 3 contains Nigerian Agricultural sector overview and performance while section 4 and 5 where the methodology employed, empirical result and discussion and thereafter it was summed up with conclusion and recommendation in section 6.

### 2 Literature Review

In Nigeria the agricultural sector still remains the most important sector of the economy despite it

neglect, it is however no news before oil, the sector was the pillar of the Nigeria's economy providing employment and source of livelihood for the increasing population and accounting for over half of the GDP of the country. Fasminrin and Braga (2009) ascertained that the main reason for the slow of agricultural development in Nigeria despite the volumes of scientific information to engender improvement is due to poor policy formulation and implementation by the federal government, which implies that there should be a strategy to guide the formulation of policies and the implementation of activities that will lead to a set goal.

However, development economists have focused on how agriculture can best contribute to overall economic growth and modernization. Todaro and Smith (2003) looked at Lewis theory of development, reporting that the underdeveloped economy consists of two sectors. These sectors are the traditional agricultural sector characterized by zero marginal labour productivity and the modern industrial sector. Rostow's (1960) leading sector growth stage approach, identifies five stages in the transition from primitive to a modern economy they are; (a) the traditional society, (b) the preconditions for take off, (c) the take off, (d) the drive to maturity and (e) the age of high mass consumption. Rostow's objective in identifying the five stages of growth and the dynamic theory of production, was primarily concerned with the process by which a society moves from one stage to another and providing policy guidance to the leaders of developing countries. Rostow's system is however the only one which clearly specifies a dynamic role of the agricultural sector in the transition process, stating that in an open economy, primary sector industries may act as leading sector and at a particular time carry the burden of accelerating growth, in addition agriculture must (a) provide food for a rapidly increasing population, (b) provide a mass market for the products of the emerging industrial sectors and (c) generate the capital investment for new leading sector outside of agriculture.

One of the most sought after ways to improve agricultural production especially in developing economies like Nigeria is to source for funds through FDI. Furtan and Holzman (2004) defined it as the most spectacular manifestation of globalization that occurred since 1990. Ogbanje et al (2010) also defined it as a major component of international capital flows, been investment by multinational companies with headquarters in developed countries. This investment ranges from transfer of funds to whole package of physical capital, techniques of production, managerial and marketing expertise, products, advertising and business practices for the maximization of global profits. However, Omankhanlen (2011) in his study of the impact of FDI on Nigeria's economy found no empirical strong evidence to support the notion that FDI has been pivotal to economic growth in Nigeria, which could have justified the effort of successive governments in the country at using FDI as a tool for economic growth even though he recognized its importance. According to Alfaro et al (2009) there is a widespread belief within policy circles that FDI enhances the productivity of host countries and promotes economic development. This implies that FDI may not only provide direct capital financing but also creates positive externality via the adoption of foreign technology and know-how.

### **3 Nigeria's Agriculture Sector Overview and Performance**

Nigeria is one of the largest countries in Africa with a geographical total area of 923,770 square kilometers/ 356,700 square miles and a total land area of 910,770 square kilometers is boarded by the Gulf of Guinea, Benin, Cameroon and Chad, the topography ranges from mangrove swampland along the coast to tropical rain forest and savannah to the north, the country is between the equator and tropic of cancer. The diversity of climate conditions, the richness of soil and water sources has provided it with the potentials for crop, animal and tree production which its major crops includes, beans, cashew nuts, cassava, groundnuts, maize (corn), palm kernels, plantains, palm oil, rubber, sorghum, soybeans, yam, etc.

The country has a highly diversified agro ecological condition, which has made it possible for her to produce agricultural products that falls into food crops produced for home consumption and for commercial (exportation), despite its richness in human and natural resources, it has the potential to become the Africa largest economy and also a major player in the global economy.

The performance of the Nigeria agricultural sector has been impressive recently; there is a trend in the indices of production that generally in the agricultural sector, there is a positive growth rate in staple crops, livestock, forestry, fishery and the sector aggregate production. Table 1 shows the growth in the agricultural sectors contribution to GDP in percentage from 2000 to 2009 increased by 5.02%. Although there was positive growth contribution to the GDP over the years, much more financial effort is needed

to enhance the production of livestock, forestry and fishery sub-sectors, as the bulk of the production of the sector comes from only crop production. From the list of several economic indicators and their measurement indices, such as share of agriculture in the real GDP percentage, annual growth rate of agriculture's real GDP percentage, agriculture share of total value of export percentage, Average per caput calorie intake from cereals and tuber daily and Average per caput protein intake from animal and fish source daily.

**Table 1 Growth in the Agricultural Sectors Contribution to GDP in Percentage (2000-2009)**

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Crop Production	22.00	28.50	29.2	29.06	30.48	29.02	28.50	29.55	27.45	33.20
Livestock Production	2.60	3.30	3.40	2.04	2.14	2.15	2.04	2.10	2.02	2.44
Forestry Production	0.50	0.60	0.60	0.14	0.45	0.42	0.40	0.40	0.40	0.44
Fishery Production	1.20	1.60	1.70	1.09	1.44	1.17	1.06	1.09	1.00	1.20
Total/Agriculture	26.30	34.00	34.90	32.60	34.21	32.76	32.00	33.15	30.87	37.87

Source: CBN statistical Bulletin (2010)

#### 4 Methodology

In other to achieve the stated objective we used annual data for the period 1980 to 2009. The annual variables of Gross Domestic Product, Labour Force and China FDI Inflow to Nigeria data were sourced from UNCTAD, while variables like Agricultural Output, Government Expenditure and Exchange Rate data were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and the last variable Total China Trade Volume to Nigeria data was sourced from National Bureau of Statistics China.

##### 4.1 Model specification

This paper uses a Vector Auto Regression (VAR) to identify the relationship between FDI, Trade inflow from China and Agricultural Development in Nigeria. The hypotheses are tested according to seven macroeconomic variables.

$$AG_t = f(GE, LF, GDP, FDI, TV, ER) \quad (1)$$

Where

$AG_t$  is Agricultural output

$GE_t$  is Government Expenditure

$LF_t$  is Labour Force

$GDP_t$  is Gross Domestic Product

$FDI_t$  is China Foreign Direct Investment inflow to Nigeria

$TV_t$  is Total China Trade Volume in Nigeria

$ER_t$  is Exchange Rate

$\mu_t$  is the stochastic random term

In a more explicit and econometric form, equation (1) can be stated as

$$AG_t = \alpha_0 + \alpha_1 GE_t + \alpha_2 LF_t + \alpha_3 GDP_t + \alpha_4 FDI_t + \alpha_5 TV_t + \alpha_6 ER_t + \mu_t \quad (2)$$

##### 4.2 Estimation techniques

The study employs a three-step procedure in order to determine the relationship between Gross domestic Product (GDP), Government Expenditure, Labour Force, Agricultural Output, China FDI inflow into Nigeria, Total China Trade Volume in Nigeria and Exchange rate. These procedures are:

###### 4.2.1 Granger Causality Test

Granger Causality test was conducted to identify causal relationship between the variables Gross domestic Product (GDP), Government Expenditure, Labour Force, Agricultural Output, China FDI inflow into Nigeria, Total China Trade Volume in Nigeria and Exchange rate, and to determine whether the current lagged values of one variable affect another. According to Granger (1969), a variable  $Y$  is caused by another variable  $X$  if  $Y$  can be predicted well from past values of  $Y$  and  $X$  than from past values of  $Y$  alone. Two regressions must be performed to test for causality between them. These regressions provide an F statistic with which the statistical significance of the coefficients of past values of a variable can be tested. The Granger test may be explained with the help of the following equations:

$$X_t = a_0 + \sum_{j=1}^m a_j x_{t-j} + \sum_{j=1}^n b_j y_{t-j} + e_t \tag{3}$$

$$Y_t = c_0 + \sum_{j=1}^m c_j x_{t-j} + \sum_{j=1}^n d_j x_{t-j} + w_t \tag{4}$$

Where  $X$  and  $Y$  are two stationery time series,  $a_0, c_0, a_j, c_j, b_j$  and  $d_j$  are coefficients,  $e_t$  and  $w_t$  are uncorrelated white noise series. The definition of causality given above implies that if  $Y_t$  is to cause  $X_t$ , then some  $b_j$  are non-zero. If both the events occur simultaneously, there is said to be a feedback between  $X_t$  and  $Y_t$ . In other words, the null hypothesis  $Y_t$  does not strictly Granger-cause  $X_t$  is rejected if the coefficients on the lag values of  $Y_t$  in equation (1) are jointly significantly different from zero. Bidirectional causality exists if the null hypothesis, that  $X_t$  does not strictly Granger-cause  $Y_t$ , is also rejected.

#### 4.2.2 Unit root test

We applied the Augmented Dickey-fuller (ADF) test and the Philips-Perron test to check whether each data series is integrated and has a unit root, thereby testing the stationarity of the seven (7) time series. A variable that has a unit root is non-stationary in the level form but becomes stationary after being differenced once such a variable is also called integrated of order one and it is usually denoted by  $I(1)$ . hatemi-j and Hacker (2004) pointed out that it is crucial to test for unit root because in the presence of the unit roots the standard distribution of test statistics are not correct and there is a risk of having spurious regression results. In this study, the ADF tests and PP test were conducted on first and second differenced observations by estimating the following three models of (1) no intercept no trend (2) intercept no trend and (3) intercept and trend model;

$$\Delta y_t = \gamma y_{t-1} + \sum_{i=1}^k \beta_i \Delta y_{t-i} + \varepsilon_t \tag{5}$$

$$\Delta y_t = \infty_0 + \gamma y_{t-1} + \sum_{i=1}^k \beta_i \Delta y_{t-i} + \varepsilon_t \tag{6}$$

$$\Delta y_t = \infty_0 + \infty_{2t} + \gamma y_{t-1} + \sum_{i=1}^k \beta_i \Delta y_{t-i} + \varepsilon_t \tag{7}$$

Where  $\Delta y_t = y_t - y_{t-1}$  is the first difference of the series  $y_t$ ;  $\Delta y_{t-1} = (y_{t-1} - y_{t-2})$  is the first difference of  $y_{t-1}$  etc,  $\infty, \gamma$  and  $\beta_i$  are parameters to be estimated and  $\varepsilon_t$  is a stochastic disturbance term. The three equations differ in the inclusion or exclusion of the deterministic elements  $\infty_0$  and  $\infty_{2t}$ . Having established the non-stationarity of the six variables, the next step is to test for the presence or absence of a long-run equilibrium among the variables.

#### 4.2.3 Cointegration test

We use the Cointegration test, which is an econometric property of time series variables. If two or more time series are themselves non-stationary, but their linear combination is stationary, then the series are said to be co-integrated. In practice, cointegration is a means for correctly testing those hypotheses concerning the relationship between two series with unit roots. The cointegration test is based on the maximum likelihood estimators of a vector autoregressive (VAR) process. The likelihood ratio-test statistic for the hypothesis of the at most  $r$  co-integrated relationship and the at least  $m = n - r$  common trend is given by:

$$\lambda_{trace} = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \tag{8}$$

$$\lambda_{\max} = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{9}$$

Where :

$\lambda_{trace}$  is the trace statistic,

$\lambda_{\max}$  is the eigen-max statistic,

$\hat{\lambda}_i$  denotes the smallest estimated eigen-values,

$T$  is the sample size.

The null hypothesis tested in  $\lambda_{trace}$  is no cointegration. In fact, for bivariate cointegration tests, up to two null hypotheses can be tested. If the null that  $r = 0$  is rejected, at least one cointegrating vector may exist, and the second hypothesis that  $r \leq 1$  is subsequently tested.

## 5 Empirical Analysis

### 5.1 Unit Root test result

First, we test if the relevant variables are stationary and to determine their orders of integration. We use both the Augmented Dickey Fuller (ADF) and Phillips – Perron (PP) tests to find the existence of unit root in each of the time series. The results of both the ADF and PP tests are reported in Table below 2 and 3.

**Table 2 Unit Root Test Stationarity at First difference**

Variables	ADF None	ADF Intercept	ADF Trend & Intercept	PP None	PP Intercept	PP Trend and Intercept
GDP	-2.319 (-1.953)*	-2.134	-3.438 (-3.233)***	-3.664 (-2.650)*	-3.572 (-2.971)**	-4.030 (-3.580)**
GE	-3.814 (-2.650)*	-3.760 (-3.689)*	-4.624 (-4.323)*	-3.791 (-2.650)*	-3.735 (-3.689)*	-4.607 (-4.323)*
LF	-2.483 (-2.650)*	-1.003	-3.323 (-3.243)***	-2.664 (-2.650)*	-3.246 (-2.971)*	-3.087
AG	-5.114 (-2.650)*	0.111	-1.986	-5.114 (-2.650)*	-5.023 (-3.689)*	-5.489 (-4.323)*
FDI	-5.624 (-2.650)*	-5.519 (-3.689)*	-5.691 (-4.323)*	-5.620 (-2.650)*	5.516 (-3.689)*	-5.691 (-4.323)*
TV	4.121	4.007	3.488	-4.195 (-2.650)*	-4.613 (-3.689)*	-5.889 (-4.323)*
ER	-4.130 (-2.650)*	-4.617 (-3.689)*	-4.700 (-4.323)*	-4.162 (-2.650)*	-4.617 (-3.689)*	-4.700 (-4.323)*

Note: \*, \*\*and \*\*\* denote significance at 1%, 5% and 10% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

Source: Author’s Estimation using Eviews 5.

The result in table 2 above shows that all the variables were stationary in the First difference. This can be seen by comparing the observed values (in absolute terms) of both the ADF and PP test statistics with the critical values (also in absolute terms) of the test statistics at the 1%, 5% and 10% level of significance. Result from table 2 provides strong evidence of stationarity. Therefore, the null hypothesis is rejected and it is sufficient to conclude that there is a presence of unit root in the variables at the first difference, following from the above result, all the variables were differenced once and both the ADF and PP test were conducted on them, the result as shown in table 3.

The table below reveals that all the variables were stationary at second difference, on the basis of this, the null hypothesis of non-stationary is rejected and it is safe to conclude that the variables are stationary. This implies that the variables are integrated of order one, i.e. 1(1).

**Table 3 Unit Root Test Stationarity at Second difference**

Variables	ADF None	ADF Intercept	ADF Trend & Intercept	PP None	PP Intercept	PP Trend and Intercept
GDP	-6.675 (-2.653)*	-6.479 (-3.699)*	-6.223 (-4.339)*	-6.651 (-2.653)*	-6.442 (-3.699)*	-6.086 (-4.339)*
GE	-6.155 (-2.656)*	-3.413 (-3.020)*	-3.202	-17.463 (-2.653)*	-17.203 (-3.699)*	-16.64 (-4.339)*

LF	-4.682 (-2.664)*	-6.173 (-3.769)*	-4.501 (-4.394)*	--4.288 (-2.653)*	-4.256 (-3.699)*	-4.223 (-3.587)*
AG	-4.134 (-2.674)*	-3.977 (-3.769)*	-4.288 (-3.632)*	-9.334 (-2.653)*	-9.272 (-3.699)*	-9.744 (-4.339)*
FDI	-2.799 (-2.685)*	-2.574	-3.101	-10.901 (-2.653)*	-10.848 (-3.699)*	-11.27 (-4.339)*
TV	1.986	1.456	0.057	-7.643 (-2.653)*	-7.745 (-3.694)*	-12.50 (-4.339)*
ER	-8.052 (-2.653)*	-7.904 (-3.699)*	-7.727 (-4.339)*	-14.813 (-2.653)*	-15.045 (-3.699)*	-13.99 (-4.339)*

**Note:**\* and\*\* denote significance at 1%, 5% and 10% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

Source: Author’s Estimation using Eviews 5.1

### 5.2 Cointegration test result

Having confirmed the stationarity of the variables, we proceed to examine the presence or non-presence of cointegration among the variables. When a cointegration relationship is present, it means that all the seven (7) variables employed, share a common trend and long-run equilibrium as suggested theoretically. We did the cointegration analysis by employing the Johansen and Juselius multivariate cointegration test. Table 4 and 5 below shows the result of the cointegration test. In the table both trace and maximum Eigenvalue statistic indicates that there is a present of cointegration at 5 percent level significance, suggesting that there is cointegration or long-run relations between the variables so tested.

**Table 4 Unrestricted Cointegration Rank Test (Trace)**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.926935	213.9422	125.6154	0.0000
At most 1*	0.914192	140.6826	95.75366	0.0000
At most 2*	0.630911	71.92473	69.81889	0.0336
At most 3	0.472495	44.01666	47.85613	0.1096
At most 4	0.411684	26.10795	29.79707	0.1255
At most 5	0.274576	11.25420	15.49471	0.1963
At most 6	0.077749	2.266250	3.841466	0.1322

Trace test indicates 3 cointegration egn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\* MacKinnon-Haug-Michelis (1999) p-values

**Table 5 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)**

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.926935	73.25954	125.6154	0.0000
At most 1*	0.914192	68.75791	95.75366	0.0000
At most 2*	0.630911	27.90807	69.81889	0.2178
At most 3	0.472495	17.90870	47.85613	0.5028
At most 4	0.411684	14.85375	29.79707	0.2993
At most 5	0.274576	8.987954	15.49471	0.2872
At most 6	0.077749	2.266250	3.841466	0.1322

Trace test indicates 2 cointegration egn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\* MacKinnon-Haug-Michelis (1999) p-values

### 5.3 Granger causality test result

**Table 6 Pair-wise Granger Causality Test**

Null Hypothesis:	Obs	F-Statistic	Probability
AG does not Granger Cause GDP	28	20.8773	6.8E-06
GDP does not Granger Cause AG		7.32654	0.00345
AG does not Granger Cause GE		2.45770	0.10781

GE does not Granger Cause AG		5.14443	0.01424
AG does not Granger Cause LF		0.46913	0.63140
LF does not Granger Cause AG		1.76485	0.19362
FDI does not Granger Cause AG		2.04451	0.15232
AG does not Granger Cause FDI		1.97416	0.16172
TV does not Granger Cause AG		6.48120	0.00586
AG does not Granger Cause TV		9.65576	0.00090
ER does not Granger Cause AG		0.49772	0.61431
AG does not Granger Cause ER		3.40974	0.05048

The estimated result obtained from Granger Causality test in the table above shows that variable like Gross Domestic Product (GDP) and Nigeria-China bilateral trade volume (TV) has a bidirectional relationship with Agricultural output (AG) which shows that they are statistically significant in explaining changes in agricultural output in the country.

The result indicate a unidirectional relationship as causality runs from Agricultural output (AG) and Government Expenditure (GE). Government expenditure in the agricultural sector happened to be significant in explaining agricultural development in Nigeria. For instance the current expenditure on agriculture stands at ₦78 billion which is 2.7 percent of the total budget for the year 2012 with the objective to secure food and feed needs of the nation, enhance generation of national and social wealth through greater export and import substitution and enhance capacity for value addition leading to industrialization and employment opportunity. On the other hand agriculture does not contribute to government expenditure due to the fact that revenue realized from the sector is not properly channel back to the sector to generate more revenue rather it is used for importation of fertilizers and some major food crops like rice. For instance the consumption of rice in Nigeria has risen tremendously at about 10 percent annum due to changing consumer preferences, therefore the importation of rice into the country today stands at about 1million metric tons yearly, resulting that Nigeria is spending annually over US\$300 million on rice importation alone and \$4.2 billion on fertilizer making the country the second importer of rice in the world.

However, The result shows that there is no any casual relationship between Labour Force (LF) and agricultural output (AG), which shows that Labour Force is statistically insignificant in explaining changes in agricultural development in Nigeria due to the fact that urbanization holds back production. This indicates that neglect on rural infrastructure affects the profitability of agricultural production and also lack of roads impedes of marketing of agricultural commodities has prevented farmers from selling their produce at reasonable prices and has lead to spoilage, which has resulted to large migration of young able men and women from the rural areas to urban centers in search for white collar jobs instead of embarking on agriculture which has lead to shortage of skilled manpower in the sector.

Furtherance to the result above, it indicates that there is no causal relationship between China foreign direct investment inflow to Nigeria (FDI) and Agricultural output (AG) which has resulted to low level of private investment and low level investment in research and development in the sector, therefore the FDI inflow from China is not focusing on agriculture which can be an excellent source of boosting local economic growth but rather on oil and other sector of the economy which is more profitable. In order to attract FDI and improve the R&D investment in the agricultural sector to boost agricultural production in Nigeria, farmers need access to new technologies. However due to neglect in the sector and the government over dependence on oil, agricultural sector lacks adequate investment influx, recently China has sent about five hundred (500) agricultural experts to assist in teaching the rural farmers, beside that there is also collaboration at state and provincial level among which are the Hubei province, Osun state and Bauchi state government.

Finally the result indicates that Exchange rate (ER) does not Granger cause Agricultural output (AG) and on the other hand agricultural output (AG) Granger cause Exchange rate (ER). Therefore the result shows that there is a unidirectional relationship between the two variables, this means that Agriculture output is statistically significant in explaining changes in Exchange rate of the country. However, it generally indicates that despite the neglect of the sector it still contributes to the country's economy growth. Moreover exchange rate does not Granger cause agricultural output mainly to the fact that there is volatility in exchange rate of the country which has lower the income earnings of farmers

and has subsequently lead to decline in output production and reduction in export production which has resulted to poor performance and lack of competitiveness in the country's agricultural produce in the international market.

## 6 Conclusions

Agricultural sector is the mainstay of Nigerian economy, ensuring food security, rural development, being a major source of raw materials and foreign exchange, employing over 70 percent of the Nigeria labour force and serving as a potential vehicle for diversifying the Nigeria economy. Nevertheless, the sector has the potential to be seen as spring board from which the country's development can take off. Indeed more often than not agricultural activities are usually concentrated in less-developed rural areas where there is urgent need for rural transformation, redistribution, poverty alleviation and socio-economic development. Similarly there is a need to say that evidence from the contribution that the sector has made, it indicate that agricultural sector in Nigeria has been the engine that contributes to the growth of the overall economy.

Despite these laudable efforts by the government, Nigeria's agricultural sector still is characterized by low yields, attributable to low level of technology, low level of inputs and limited areas under cultivation, low productivity, low private sector investment, lack of competitiveness, shortage of skilled manpower, poor development of value chain and low value addition, low investment in research and development, poor policy instability and discontinuity. The research finding reveals that using the Augmented Dickey Fuller (ADF) and Philips-Parron (PP), the result indicate that there is a strong evidence of stationarity between the variables employed. Johansen and Juselius multivariate cointegration test indicate that there is a present of cointegration, suggesting that there is a long-run relationship between the seven (7) variables. Granger causality test result shows that Gross Domestic Product (GDP) and Nigeria-China bilateral trade volume (TV) has a bidirectional relationship with Agricultural Output (AG) while Government expenditure (GE) and Exchange Rate (ER) has a unidirectional relationship with Agricultural output (AG) also the result shows that Labour Force (LF) and China foreign direct investment inflow into Nigeria (FDI) has no causal relationship with agricultural output.

However, based on the empirical findings it is recommended that there is a need for the government to provide legal and administrative quality framework for effective commercialization that will encourage more exportation of agricultural output as this in turn will enhance external foreign exchange earnings and improve the competitiveness of Nigeria agricultural produce in the international market, help in the liberalization of regulated backbone services, which provide opportunities for private investment and management that were hitherto unavailable and strengthen FDI-related institution in Nigeria Such as the NIPC, BPE and NEPZA at administration, policy and promotion level and also provide more funding for agricultural universities in the country to carry out more research on all aspects of agricultural output, such as livestock, crops, fishing and forestry, crop preservation.

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# Analysis of Problems of Corporate Intellectual Property Strategy and Countermeasures

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**Abstract:** Scientific and technological activities are a very important part of independent innovation, and technology management is the organization and management of scientific and technological activities. To strengthen intellectual property management is very important for the protection of the new achievements of scientific and technological activities. In this paper, basing on the definition of contents from the different objects of scientific and technological activities, it focuses on the analysis of scientific and technological activities' status quo, emphasizes the important role of patent in technology management, and raises corporate intellectual property management strategy implemented in the management of scientific and technological activities according to corporate role and task in science and technology activities.

**Keywords:** Scientific and technological activities; Technology management; Intellectual property

## 1 Introduction

The recommendations of the CPC Central Committee's eleventh five-year plan on economic and social development puts forward that the improvement of independent innovation capability should be looked as the central link of economic restructuring and transformation of pattern of economic growth. The improvement of capability of independent innovation needs the formation of independent intellectual property rights in strategic areas and key links. The intellectual property system is the key link and important guarantee to promote technological innovation, accelerate the industrialization of high-tech achievements, and improve economic competitiveness. To strengthen the technology-related intellectual property rights management and protection is both an urgent requirement to enhance our scientific and technological ability to continuously innovate and solve the source of the problem of technological innovation, and also is an inevitable choice for China's entry into the WTO, coping with international competition, and turning pressure into motivation. Therefore, the work of intellectual property rights is an important part of the scientific and technological innovation work. To strengthen the management and protection of technology-related intellectual property rights is an important means to promote our level of technological innovation and enhance our technological and economic competitiveness. After joining the WTO, we are faced with the new challenges of a large number of patent applications and technology control from multinational companies in China. We must take effective measures as soon as possible to change the unfavorable situation of intellectual property protection in technological innovation and raise the awareness of the importance of intellectual property work. Based on management system, incentive mechanism and support policies, intellectual property protection should be strengthened in scientific and technological fields so as to increase the total of China's independent intellectual property rights substantially, and to improve the competitiveness of China's science and technology.

## 2 Main Contents of Scientific and Technological Activities

Scientific and technological activities are mainly referred to scientific and technological development, also with technology innovation-related activities, which include scientific and technological research, new product development, production, teaching & research cooperation, academic exchanges, technology transfer and so on. In China, scientific and technological activities appear four levels of government, universities & research institutes, enterprises and individuals. As the purpose of each level, objects, and the results achieved are different, the content of its activities is not the same too. From the perspective of the government's scientific and technological activities are engaged in through the formulation of public policies, whose content is to provide services for enterprises, whose aim is to improve the region's scientific and technological innovation capability and core competitiveness; the scientific and technological activities of universities and research institutes is to improve the technological level of the human through basic research, to advance technological level of the whole society through a high level of technology development, and to

achieve the value of knowledge through technology transfer and result conversion; the scientific and technological activities of enterprise is to enhance the product competitiveness through technological innovation, and to form market share and monopoly, whose purpose is to maximize the benefits. So the scientific and technical activities of enterprise should be inner, active, and are the main body of whole scientific and technological activities; the individual's scientific and technological activities are carried out by individual's creative thinking and research & development. Relatively the purpose is not clear, and therefore a smaller proportion of the entire scientific and technological activities.

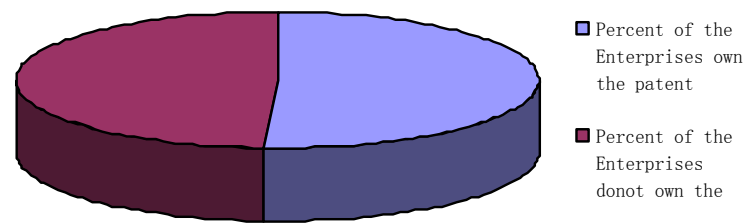
Among them, the scientific and technical activities of enterprise are the most active in all scientific and technological activities. As companies involve in all walks of life gradually and become the basis of scientific and technological achievements, the results of scientific and technological activities are ultimately reflected in the production of enterprises. In addition to its own product development, the scientific and technical activities of enterprise include production, teaching & research, participation in the scientific and technical activities of universities and research institutes, as well as undertaking the government's scientific and technological projects. Due to the differences in size and products, the scientific and technological activities have different effects in different enterprises, showing the features of diversity and complexity.

### **3 The Status Analysis of Scientific and Technological Activities of Enterprise**

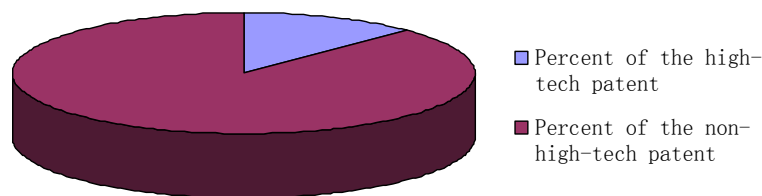
Since the accession to the WTO, on the one hand enterprises compete with each other on a larger scale, on the other hand manufacturing shifts to China with the large-scale entry of international capital. China's enterprises, especially minor enterprises, are facing with fierce market competition and frequent trade protection of technical barriers in export trade, which force enterprises to enhance the competitiveness of enterprises by science and technology progress and accelerating new product development. The domestic market, after two decades of reform and opening up, has transformed from the supply-side market to a buyer's market, and the production capacity of vast majority of goods excesses. In order to win the market, enterprises must rely on technological innovation to make product better quality, more powerful, use of more humane.

Compared with developed countries, due to the capability of independent innovation lacks, enterprises and industries of our country are facing serious challenges of new technology and intellectual property, and sources of technology for most enterprises rely mainly on the introduction and imitation and secondary innovation is insufficient. The majority of core technology of China's enterprises, brands and distribution channels are still controlled by foreign companies. Enterprises have few technologies and products of independent intellectual property rights, and their technology manpower's overall level and quality are to be improved. Many problems remain in product development, intellectual property and the use and train of scientific and technical personnel. We made a statistical analysis of the provincial high-tech enterprises and enterprise technology centers in Zhenjiang City, Jiangsu Province, and found that companies have the prevalence of following aspects:

Enterprises technology innovation capability is weak. China's enterprises, especially minor enterprises due to long-standing inadequate investment in science and technology, imperfect technological innovation system, and the lack of high-quality science and technology leading talent and other reasons, the research and development capacity is relatively weak. It is reflected in the less commitment to science and technology projects, much less original innovation, and most of the scientific and technical personnel in enterprises is so hard to put out scientific papers of high academic standards. For a long time, technology and process are carried out mainly by imitation. New products and new technologies' research depend mainly on universities and research institutes, and integrated innovation, introduction, digestion and innovation of absorption of scientific and technological achievements are little. In the process of commitment to science and technology projects, the implementation of enterprises' technology development and new product development, they often pay attention to the products of major competitors, but understand the development trend of entire field little by scientific literature and patent search.



a. Patents of the enterprise application



b. High-tech patents

**Figure 1 The Status of the Enterprise Patent Application in Zhengjiang City**

The protection awareness of independent intellectual property of enterprises needs to be improved. In Zhenjiang City, Jiangsu Province, for example, 175 of the city's total high-tech enterprises above the provincial level, of which has applied for the patent is only 89, accounting for 50.86%. In 20 years there are 584 total patent applications, including 73 inventions of the representative of the level of scientific and technological innovation, only 12.5%. There are significant gaps between 423 utility model patents and hundreds or even thousands of pieces patents applied by foreign technology companies (as shown in Figure 1). Especially for invention patents reflecting the level of technological innovation, the gap is more pronounced. In 160 award projects applying for Zhenjiang Science and Technology Progress Award received by Zhenjiang City Bureau in 2005, only 36 projects had applied for patents or acquired authorization of inventions or utility model patents, most of which come from colleges and universities. Through investigation, we found that both decision-makers and corporate staffs had relatively weak awareness of patent. Most enterprises even do not know what technology can be applied for a patent and the function of patent in business. Some enterprises are starting to focus on the patent application after suffering from patent claims or punishments. In foreign exhibitions some affairs that items on display were forced to withdraw have occurred due to the lack of intellectual property of testimonial material against complaints.

The building of enterprise technology team is difficult to meet the needs of the scientific and technological innovation. Corporate scientific and technical personnel are the main body in technological innovation, who undertake some scientific and technological activities of new product development and so on. For most enterprises, their core technology and scientific and technological achievements come mainly from technology transfer and result conversion of universities and research institutes. Because of a lack of appropriate platforms and academic technology leaders, these enterprises are difficult to independently develop original scientific and technological innovations of high technology content, and even lack of the abilities of integrated innovation and secondary innovation. Some enterprises' scientific and technical personnel are generally short of basic skills for technological innovation as papers written, literature search, and foreign language reading, and they rarely participate in international and domestic academic exchanges and timely read of the latest scientific literature. Many enterprises allot the jobs of required written materials for declaring scientific and technological

projects to university teachers and science and technology intermediary. Compared with the engineers in the United States and European companies, many of whom have put out articles in the high level of academic journals and acquired patents, there is a big gap. The lack of research capacity of scientific and technical personnel results in insufficiency of businesses' innovation capability and increase of cost of production, teaching & research.

The construction of technological innovation platform lags far behind. The technological innovation platform mainly refers to the public service platform mainly created by government and serving for enterprises, including large-scale equipment's information service platform, scientific and technological achievements' conversion service platform, scientific literature's public service platform and intellectual property rights' public service platform and so on. For most small and medium-sized enterprises, they need to solve the problems that instruments or test equipments is scarce and literature search is difficult in the process of technological innovation, but these problems can not be solved by them on their own. In recent years, many cities in China are committed to building the technological innovation service system, and to enhancing scientific and technological innovation capacity by exploring the construction of the public service platforms above. However the public service platforms that are able to meet enterprises' demands truly are rare.

Scientific and technological innovation system of construction is lagging behind. The system construction is one of the keys to the success of enterprises' technological innovation activities. These systems include enterprise technological innovation motivation system, enterprise technology resource allocation system, technological and innovative funding mechanisms, training system of scientific and technical personnel, scientific and technical management system of personnel and projects and the intellectual property system. Lack of scientific and technological innovation system, the scientific and technological innovation would be difficult to effectively be developed, the enthusiasm of scientific and technical personnel would be difficult to mobilize, the assessment of scientific and technological activities would be difficult to carry out, and the scientific and technical personnel would be difficult to fully play their roles through echelon construction.

## **4 Enterprise Intellectual Property Strategy in Technology Management**

### **4.1 The establishment of enterprise intellectual property system**

For enterprises, it is advisable to recognize that the use of patent protection for technological innovation achievements is enterprises' own needs, and also an effective weapon for enterprises to seize the market. The first thing for corporate intellectual property strategy is the establishment of an effective intellectual property system which prevents intellectual property and innovation achievements from loss in the system aspect. To establish corporate intellectual property strategy based on the characteristics of enterprises, either the system is offensive or defensive, through effective implementation of which to protect new technology activities being developed effectively. These systems include the reward system of intellectual property rights, and the creators of the achievements will be rewarded; the secrecy system of employees intellectual property, which protects intellectual property rights of enterprises in the process flow of scientific and technical personnel, not to appear the results follow where the personnel go; the censorship system of intellectual property rights in scientific and technological cooperation and economic exchanges, which makes technology transfer in scientific and technological cooperation technology transfer of real right holders, avoids intellectual property disputes in the fulfillment of economic contracts.

### **4.2 Enterprise intellectual property strategy in scientific and technological activities**

First, for enterprises' technological innovation it is necessary to avoid infringement, that is, mature products put in a lot of manpower and resources have been covered by patents and turn into the infringing products; Second, take full advantage of existing technology and results to achieve the second innovation, and avoid repetition simply; Third, to strengthen the awareness of IPR protection and give effective protection of innovation through the patents or other intellectual property protection measures. To strengthen intellectual property protection while innovation. Only in this way it is possible to change the advantages of technology into the advantages of resources. Concrete strategies can be taken as following:

The current implementation of patent literature search. To analyze the future patent R&D fields before determining R&D program. Through in-depth search, it is probable to understand the latest technology developments and progress of the field, and to determine whether to continue this project according to the distribution of patent and legal status. The technologies and products covered by a large

number of patents should be treated seriously. For the fields that there are some but not too many patents, it is possible to take the secondary development and bypassing the claims' strategy to start technological research, which can avoid infringement. For those areas not yet applied for a patent it can be assured that the implementation of the project. In addition, the analysis and study of the specification of a patent can take full advantage of the existing results and patent literature, which makes R & D activities begin at a higher level and platform.

Assigning real person responsible for the project management of intellectual property. Formulate projects' intellectual property strategy meantime in the preparation of planned tasks or project proposals. Focus on the protection of key technologies to ensure that innovations arising can be applied for a patent in the implementation of the project timely, and obtain effective protection. At the same time, the tasks of patent applications are decomposed to the task force members and all technologies for patent are to be pre-qualified.

Intellectual property management in project implementation. Because a patent has the timing and regional characteristics and three requirements of novelty, creativity and practicality, the companies may protect either technology innovative ideas and methods or the technological innovation of products and devices through patents. So the applications of patent are carried out in stages in the implementation of the project. In the initial stage it is mainly a technical thinking or methods to be applied for invention patents. In the project process, the application for invention or utility model patent on the initial results can be done based on different situations. In the end of the project acceptance phase, it is necessary to summarize the results of the project and the key technologies. And the project's overall intellectual property strategy is proposed, the core technology patent applications programs and the protective patent applications programs are decided, the patent portfolio program of the project is formed, and the IP strategy is formulated before technologies and products are public, all of which protect scientific and technological innovations fully.

The establishment of enterprise technology, product patent database. Through the establishment of enterprise patent database, it is feasible to analyze dynamically the technologies and products' latest developments and the patent distribution of competitors in this area and to understand the science and technology trends of the industry and competitors' marketing strategy. The corporate R&D plans and sales strategy are timely made.

#### **4.3 The intellectual property strategy in enterprise management**

Through the distribution of the legal status of patent and patent rights as well as a certain stage of a technology patent applications, not only the dynamic R&D conditions in the field can be understood, but also a lot of commercial value can be dig out. Meantime enterprises can also realize a certain area of technology and market monopoly by patent applications. In general, multinational corporations make patent layout first before entering a country's market in order to ensure the access to the monopoly status of technologies and products. So companies can judge the business risks that may arise, and make relevant preparations in advance, such as the timely application of related patents to break the monopoly, the adjustment of product structure, or the changes in business strategy, etc. Equally with upcoming technologies and products of the market a retrieval analysis of the patent situation in the region should be done for the domestic enterprises before the entry into a market, to avoid patent infringement and subjecting to legal sanctions. In the case of confirmation of entry, patent application should be made first so that products obtain reliable assurance in the law when entering the market, and the relative monopoly status.

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# The Performance of Socially Responsible Investment Funds in China\*

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**Abstract:** This paper reviews the development of socially responsible investment(SRI) in China. The study takes AEGON SRI fund as a case and presents an analysis of the performance of China's SRI investment. By using the return rate and the risk-adjusted performance indicators so as to combine risk and profit abilities together, the paper undertakes a comparative analysis of AEGON SRI fund and other matching conventional funds. The study suggests SRI investment in China do not have clear disadvantages concerning their performance compared to conventional investment.

**Key Words:** Socially responsible investment; SRI funds; Performance; Comparison

## 1 Introduction

### 1.1 Background

Over the past decade, Socially Responsible Investment(SRI), also known as sustainable investment or ethical investment, has experienced an explosive growth around the world. SRI can be defined broadly as "an investment process that considers the social and environmental consequences of investments, both positive and negative, within the context of rigorous financial analysis" (Social Investment Forum (SIF), 2001:4).

There are a large variety of SRI investment such as pension funds, life insurances which can be designed with an SRI component, but the major and typical investment products with an SRI component are investment funds, which consider social and environmental aspects within their investment strategy.

Unlike conventional types of investments, SRI funds apply a set of investment screens to select stocks from an investment universe based on social, environmental and ethical criteria. Positive screens are used to select specific stocks out of the investment universe, for example low pollution emissions, equal employment opportunities and good workplace conditions. Usually, negative screen criteria are to delete such stocks like the production of tobacco, alcohol or weapon.

According to the report by Avanzi SRI Research-SIRI Group(2004), by mid-2004 there were 354 SRI funds operating in the European markets, 13% more than in 2003, and showing sustained growth since the products appeared in the early 1980s. By the end of 2005, the total assets managed by SRI investors had grown to well over 1 trillion (Eurosif, 2006). In the US approximately one of every eight dollars under management—12.2 percent of the \$25.2 trillion in total assets under management is in SRI assets (SIF report, 2010). SRI investment has been regarded as "one of the most critical factors driving the future of fiduciary investment". 'the Fundamental Research Funds for the Central Universities

### 1.2 The development of SRI in China

Although the SRI market is quite substantial in most developed countries, it is still new to China. Although China's SRI investment only appeared in recent years and the SRI market still remains almost undeveloped, the SRI has shown the early signs of a growing market in China.

In the mutual fund sector, there are only three SRI funds in China. AEGON-Industrial Fund Management Co. Ltd, an SRI pioneer in China, has offered the first and only socially responsible investment retail fund since May 2008. The AEGON-Industrial Social Responsibility Stock Fund, ( hereinafter referred to as AEGON SRI fund, AEGON) takes the 'top-down' analytical method. After selecting industries which are filled with development potentials according to the industry circle, the level of earnings, and prosperity degree, the AEGON further screens the industries with "AEGON dual screening ways", that is, avoiding companies which perform relatively bad in the implementation of Corporate Social Responsibility (CSR) with negative screening, and pursuing companies which perform bset CSR implementation and sustainability records with positive screening , optimizing the allocation of industries dynamically at regular intervals.

The Construcion Bank-SSE SRI ETF in 2010 is the first exchange traded fund that follows SSE-SRI index closely.The latest SRI stock fund-China Universal SRI stock fund was offered by China Universal Asset Management Co. Ltd in March 2011.

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The Chinese sustainability theme indices in financial market have also been developed. The first sustainability index in environmental theme, TEDA Environmental Protection Index was launched in January 2008. In 2009, the Shanghai Stock Exchange and China Securities Index launched China's first the Social Responsibility Index SSE-SRI, and then Shenzhen Stock Exchange launched SZSE Corp. Social Responsibility Index (SZSE SRI). CNINFO -Cbn-Aegon-Industrial-CSR Index was released in Nov. 2009, CNINFO Low-Carbon 50 Index was released in Oct. 2010.

## 2 Literature Review

The main focus of recent SRI literature is on the financial performance of SRI investments (Renneboog, 2008), and the major question is whether these funds perform better or worse than conventional investment funds that have no restricted investment universe. SRI funds do not earn statistically significant excess returns and that the performance of such mutual funds is not statistically different from the performance of conventional mutual funds. Qiao Haishu (2009) concludes that the financial performance comparison between SRI funds and conventional funds might be fixed, depending on the funds' location, fund size or fund age.

Michael Schroder (2004) points out that most of the studies agree that SRI funds have a similar performance with conventional funds. The hypothesis that SRI funds must have a worse performance than conventional funds due to the restricted investment universe is rejected. But the SRI funds also exhibit no out-performance.

Some studies on the performance of SRI fund investments apply the matching approach. Considering the management and transaction cost, analysts compare the SRI and conventional investment funds which otherwise have similar characteristics.

The SRI performance analysis has also been made on the SRI indices, whether stock indices that represent socially responsible investments exhibit a different performance compared to conventional benchmark indices. The studies concentrated on SRI indices and not on investment funds may exclude the possible influence from transaction cost, market timing and funds management ability. GARZ (2002) finds the DJSJ Europe index is a slightly significant but small out-performance compared to the DJ STOXX 600-index. Michael Schröder (2006) finds SRI stock indices do not exhibit a different level of risk-adjusted return compared with conventional benchmarks. But many SRI indices have a higher risk relative to the benchmarks.

## 3 Data and Methodology

In the following sections the performance of China's SRI investment funds is analysed. We use the growth rate of net fund asset value indicate the SRI investment profitability. Outstanding profit for the investment doesn't mean it is attractive to investors, because the other dimension – risk, can not be ignored. The risk control capacity can be indicated by Beta coefficient.

To research the investment performance, we cannot simply take the ability of earnings or risk into consideration, but should combine the risk control and profit abilities together. Like most of the studies of investment performance, we use Sharpe ratio, Treynor ratio and Jensen's alpha to measure risk-adjusted performance.

An important selection criterion for the SRI investment funds is the length of time series. Among the existing three SRI funds in China, AEGON SRI fund has more than 30 months' length, and the other two new established funds could not be included in the study. This study choose five other non SRI funds on the matching principle to compare the funds performance.

## 4 The Financial Performance of the AEGON-Industrial SRI Fund

AEGON SRI fund is a stock fund which achieves its goals of economic benefits and social responsibility by the fund manager's initiative allocation. AEGON SRI fund pursues the realization of current profits and long-term capital appreciation. At the same time, it emphasizes listed companies' implementation of sustainable development, legal, and moral responsibility.

Compared with the conventional stock funds which allocate assets according to economic and financial indicators, the study plans to find out whether higher or not lower performance exists in SRI funds in China. The analysis result is an important foundation to promote China's SRI development.

### 4.1 The growth rate of net asset value comparison

Considering the management and transaction cost when comparing the performance, we apply the matching principle. The study compares the performance of SRI and non SRI investment funds which

otherwise have similar characteristics e.g. concerning investment universe, fund age or fund size. AEGON is a stock fund, established on April 30, 2008, and the initial offering size is 1.388 billion. So the non SRI stock funds chosen here were founded between March to June in 2008 and with the initial offering size between 0.8 billion to 2 billion.

The growth rate of net asset value of AEGON and other five comparative funds are shown in table1.

**Table 1 The Growth Rate of Net Asset Value of AEGON and Comparative Funds**

Fund Abbreviation	AEGON	PYAS	JS	SSV	ZS	YFD
Foundation Date	2008-4-30	2008-4-16	2008-5-27	2008-6-18	2008-6-19	2008-6-19
Initial Offering Size (billion)	1.388	1.733	1.81	1.139	0.8609	1.226
Recent 3 Months(%)	3.62	1.36	3.19	5.56	2.01	3.89
Recent 6 Months(%)	-8.27	-8.23	-0.54	-6.07	-12.38	-10.09
Recent One Year(%)	-19.19	-23.46	-13.26	-18.48	-31.87	-23.14
From this Year(%)	3.89	3.61	4.1	5.78	4.1	4.91
Since Foundation(%)	33.27	-25.3	63.68	52.48	18.46	52.08

Data source: www.eastmoney.com.

Note: The full names of the funds in the above table are respectively AEGON SRI stock fund, Pu Ying An Sheng value growth stock fund, Jia Shi selection stock fund, South selection value stock fund, Zhao Shang grail blue chip stock fund, Yi Fang Da small and middle-cap stock fund. The period date ends on March 23, 2012.

From table 1, the cross-fund comparison shows that in recent three months, all funds' growth rate of net asset value are above zero, and AEGON ranks third among those funds. While in recent six months and recent one year, all funds' growth rate of net asset value are below zero, which may related to the weak market. AEGON's growth rate of net asset value ranks middle by and large in recent six months and recent one year, but it's more than zero from this year and since foundation, ranking fifth and fourth. From its longitudinal development, AEGON's growth rate of net asset value in recent one year is -19.19%, while since foundation the growth rate of net asset value is 33.27%, indicating AEGON's growth rate of net asset value in the initial two years after foundation is higher than recent one year.

#### 4.2 Compare in the single-factor indicator of SRI funds' performance

Based on the funds' monthly growth rate of net asset value from foundation date to December 2012, we can calculate all funds' Beta ( $\beta$ ), Sharpe ratio, Treynor ratio and Jensen's alpha ( $\alpha$ ). Market rate of return are composed of Shanghai A-share Index, Shenzhen Component Index, and S&P/CITIC Government Bond Index. The weight of Shanghai A-share Index and Shenzhen Component Index are both 40%, and the weight of S&P/CITIC Government Bond Index is 20%. We regard commercial bank's one-year time deposit interest rate as risk-free rate, and transform it into monthly rate. Commercial bank's interest rate had been adjusted many times during the sample period (from May 2008 to December 2011), which are respectively 4.14%, 3.87%, 3.6%, 2.52%, 2.25%, 2.5%, 2.75%, 3%, 3.25% and 3.5%. We can get the weighted average according to different interest rates' duration. That weighted average rate is 2.83% as the risk-free rate, and we can transform it into monthly rate 0.2359%.

**Table 2 The Single-Factor Indicator of Funds' Performance**

Fund	$\beta$	T statistic of $\beta$	Sharpe Ratio	Treynor Ratio	Jensen's $\alpha$	T statistic of Jensen's $\alpha$
AEGON	0.715100	9.914087	0.039200	0.003610	0.006792	1.231429
PYAS	1.051311	6.566605	0.028046	0.003039	0.009386	0.766622
JS	0.603677	6.571664	0.074780	0.008076	0.007498	1.066103
SSV	0.767585	9.490716	-0.016051	-0.001421	-0.000812	-0.137836
ZS	0.741883	8.870951	-0.010827	-0.000980	-0.000457	-0.074998
YFD	0.842521	8.047707	-0.028995	-0.002718	-0.001983	-0.260096

Note: the indicators above are calculated by monthly data from funds' foundation date to December 2011.



As is shown in table 2 all funds'  $\beta$  are statistically significant. Only PYAS's  $\beta$  is above 1, while the rest five funds'  $\beta$  are between 0.6 to 1, indicating the five funds' smaller fluctuation compared to the market portfolio. Compared to funds that are similar in age limit and size, AEGON ranks fifth according to  $\beta$ , indicating its relatively conservative investment style and lower risk. Sharpe ratio and Treynor ratio of AEGON, PYAS and JS are all above zero, which indicates their mean of monthly rate of return are larger than risk-free rate. AEGON ranks second according to Sharpe ratio as well as Treynor ratio. So AEGON's performance is relatively good based on risk-adjusted indicators of return. However, all funds Jensen's  $\alpha$  are not statistically significant according to their T statistic. So the single-factor Jensen's  $\alpha$  is not suitable for measuring the funds performance here.

## 5 Conclusion

From the comparative analysis of funds' performance above, we know the performance of China's SRI funds do not underperform the conventional funds. The SRI funds rate of return and risk-adjusted performance outperform the market benchmark slightly. SRI investment is not worse than conventional investment.

To summarize, SRI investment in China do not have clear disadvantages concerning their performance compared to conventional investment.

Facing the severe imbalance between economic growth and social/ environmental development, both the Chinese government and the general public could put more emphasis on socially responsible investment.

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# A Research on Mutual Influence Mechanism between Psychological Capital and Knowledge Transferring Based on the Mediation Effect\*

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**Abstract:** As we all know that the knowledge transferring is directly influence by the will, ability and opportunity of both parties in the knowledge transferring. However, the individual psychological capital directly influences the motive, will and ability, and then affects the effectiveness and efficiency of the knowledge transferring. Based on this, the paper firstly put forth the research on the mutual influence mechanism between the psychological capital and the knowledge transferring based on the mediation effects. Secondly, the paper reviewed the relevant literature about the psychological capital and the knowledge transferring and put forth the hypothesis of the relationship between the psychological capital and the knowledge transferring. Thirdly, the paper advanced the hypothesis of the relationship between the psychological capital and the knowledge transferring based on the mediation effect of the knowledge transferring will. Fourthly, the paper put forward the hypothesis of the relationship between the psychological capital and the knowledge transferring based on the mediation effect of the knowledge transferring ability. Fifthly, the paper conceived the comprehensive model and designed the influence path between the psychological capital and the knowledge transferring based on the mediation effect of the knowledge transferring will and ability.

**Keyword:** Psychological capital; Mediation effect; Knowledge transferring; Mutual influence mechanism

## 1 Introduction

It is well known that the knowledge transferring is directly influenced by the knowledge transferring will, ability and opportunity, but the individual psychological status has made effect on the process and result of the knowledge transferring. Therefore, if the enterprises want to make the knowledge transferring effectively and efficiently, they have to make out the organizational support measures to exert the individual psychological capital. However, if you want to make out the effective measures, firstly they have to learn about which kinds of psychological capital will influence the knowledge transferring, what their effects are, and how they influence the knowledge transferring. Based on this, the paper aimed to identify the psychological capital factors, the mediation factors and the result factors of the knowledge transferring, find out the relationships among them, and to provide the organization with the theoretic base and descriptive reference. The content of the paper can be concluded as follows. The paper firstly put forth the research on the mutual influence mechanism between the psychological capital and the knowledge transferring based on the mediation effects. Secondly, the paper reviewed the relevant literature about the psychological capital and the knowledge transferring and put forth the hypothesis of the relationship between the psychological capital and the knowledge transferring. Thirdly, the paper advanced the hypothesis of the relationship between the psychological capital and the knowledge transferring based on the mediation effect of the knowledge transferring will. Fourthly, the paper put forward the hypothesis of the relationship between the psychological capital and the knowledge transferring based on the mediation effect of the knowledge transferring ability. Fifthly, the paper conceived the comprehensive model and designed the influence path between the psychological capital and the knowledge transferring based on the mediation effect of the knowledge transferring will and ability.

## 2 Relevant Literature Reviews of Psychological Capital and Knowledge Transferring

### 2.1 Research on definition and constituent of psychological capital

In 1990s, Luthans put forth the concept of the positive psychological capital and the positive organizational behavior. In 2004, he indicated that the positive psychological capital is a kind of positive psychological status and ability<sup>[1]</sup>. It includes the self efficacy, the optimism, the hope, and the

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tenacity<sup>[2]</sup>. In 2006, Lason and Luthans put forth that the hopful employees usually have their certain objects and feasible plan and work hard to realize them<sup>[3]</sup>. In 2004, Carr emphasized that the optimism employee can positively explain their work affairs, usually have the positive psychology that is able to enlarge their scopr, receive and produce the new idea, and are creative<sup>[4]</sup>. In 2007, Luthansand Youssef indicated that the tenacity employees are able to cope with the difficulties and the adverse circumstances<sup>[5]</sup>.

**2.2 Research on effects of psychological capital**

The research on the effect of the psychological capital is divided three aspects. Firstly, the individual psychological capital makes effect on his work performance and organizational commitment. In 2007, Luthans found that the psychological capital of the employee have close relationship with their work performance<sup>[5]</sup>. In 2007, Lifeng Zhong put testified that the level of the employees’ psychological capital is positively relevant to their supervisor’s performance appraisal, their work satisfaction, organizational commitment and the Organizational citizen's behavior<sup>[7]</sup>. Secondly, the individual psychological capital is directly relevant to his work attitude and behavior. In 2007, Luthans put forth that the individual psychological capital is positively relevant to his work performance and satisfaction<sup>[8]</sup>. In 2006, Larson and Luthans put forth that the psychological capital is positively relevant to the employee’s satisfaction<sup>[3]</sup>. Finally, the individual psychological capital has made effect on the exit will and absentism behavior of the employee. In 2005, Luthans and Jensen found that the nurses’ psychological capital is positively relevant to their performance from their supervisor’s evaluation<sup>[6]</sup>. In 2009, he found that the higher level the psychological capital is, the lower the employee’s exit will is<sup>[9]</sup>. In 2008, Luthans put forward that the psychological capital is positively relevant to the performance, satisfaction and organizational commitment of the employee<sup>[2]</sup>.

**2.3 Hypothesi of relationship between psychological capital and knowledge transferring**

According to the above research, the employee with the high level of the psychological capital is better to finish his task, cope with the adverse circumstances and be loyal to his responsibility. The knowledge transferring is not only an organizational citizen behavior, but also a behavior way to enhance his performance. At the same time, the process of the knowledge transferring is filled with the failure and uncertainty. So the psychological capital is very important to the knowledge transferring. In 2001, Bloodgood put forth that the knowledge transferring is the transferring or spreading among the different organizations or individuals<sup>[13]</sup>. In 1996, Szulanski indicated that the knowledge transferring is the bilateral knowledge exchange between the providers and the receivers<sup>[14]</sup>. Therefore, the performance of the knowledge transferring results from the knowledge transferring will and ability of both parties. However, the psychological capital directly influences the knowledge transferring will and the exertion of the knowledge transferring ability. In 2000, Nonaka put forth that the knowledge transferring is a process with the socialization, the externalization, the combination and the internalization of the knowledge<sup>[25]</sup>. So the paper put forth hypothesis H1.

H1: the psychological capital is positively relevant to the knowledge transferring.

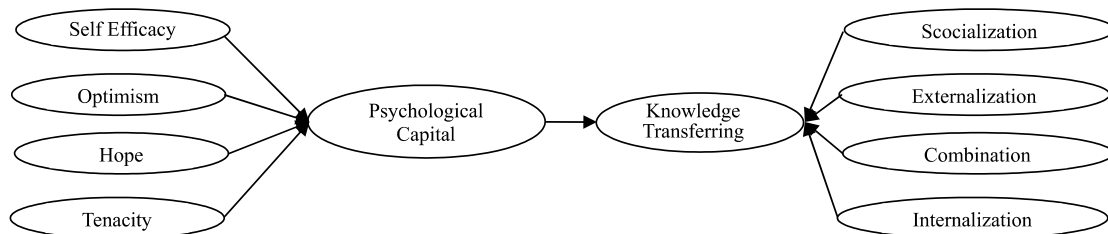
H1a: the self efficacy is positively relevant to the knowledge transferring.

H1b the optimism is positively relevant to the knowledge transferring.

H1c: the hope is positively relevant to the knowledge transferring.

H1d: and the tenacity is positively relevant to the knowledge transferring.

According to above hypothesizes, the paper conceived the explaining structural model of the influence path between the psychological capital and the knowledge transferring. It is shown in Figure 1.



**Figure 1 The Influence Path Between the Psychological Capital and the Knowledge Transferring**

**3 Influence Mechanism of Psychological Capital Based on Knowledge Transferring Will**

**3.1 Influence of knowledge transferring will**

The knowledge transferring motive of the employees influence their attitude and behavior, and improves or worsens the knowledge transferring<sup>[15]</sup>. Their motive of the knowledge transferring will enhance or reduce the knowledge transferring performance through affecting their interest and intention<sup>[16]</sup>. The bilateral will of the knowledge transferring decide on the quality and effectiveness of the knowledge transferring. In organization, the individual expert knowledge, unique skill or special experience means his right and status in great degree. In 2002, Dixon put forth that the knowledge provider is afraid of losing his competition advantage because of the knowledge transferring, so he will be unwilling to share his knowledge with others<sup>[15]</sup>. The knowledge transferring will not only influence whether the knowledge provider is able to share his valuable knowledge, but also affect the absorption of the knowledge receiver. The motive is the integration of the force to produce, introduce and maintain behavior. However, the psychological capital is able to influence the individual motive to share his knowledge<sup>[18]</sup>. The employee with high level of the psychological capital often own the positive feeling that is able to enlarge his scope, receive the new idea, creativity and practice, and share them with others<sup>[20]</sup>. However, the employee with the lower level of the psychological capital may reduce his diligence or give up<sup>[2]</sup>.

### **3.2 Influences of constituent of psychological capital to knowledge transferring will**

In 1997, Bandura put forth that the self efficacy is a kind of conviction with the good motive, the resource allocation and the necessary measure to finish a special task under the special scenario<sup>[20]</sup>. The individual with the high level of the self efficacy is willing to spend much more time and energy to develop and cultivate the community effect. Then he is able to exert his potential and get much better performance.

The optimism means the positive expectation of the result. The optimistic employee will reduce his anxiety and depression, and enhance his work satisfaction and psychological health. In 2002, Seligman indicated that the optimistic employee will attribute the positive affair to himself and the negative affair to the external environment. The optimistic employee will undertake the responsibility initiatively, transfer the knowledge with the positive way, enjoy accepting the various challenge, and encourage himself to realize the success of the knowledge transferring.

In 2002, Snyder put forth that the hope is a kind of positive motive based on the combination between the successful expectation and the realization path. In the knowledge transferring, the employee with the high level of the hope usually has certain object of the knowledge obtaining, sharing, spreading and creating. What's more, he is able to make out the specific way to realize the object through combining the characteristics of the knowledge. He often pursues to his growth and achievement and creativity, so his motive and will to transfer the knowledge will be stronger, he can bring the better performance to the organization<sup>[23]</sup>.

The tenacity is a kind of ability to positively adapt to the difficulties or dangerous conditions and recover from the challenges. The individual with high tenacity often own self-dignity, self-confidence, optimism, self-control and high level cognitive ability. The tenacity is helpful to conquer the difficulty, adapt to the environment, and enhance the recovery and initiative study. The employee with the high tenacity not only has the idea to transfer the knowledge sustainably, but also makes self-regulation to renew his knowledge, skill and ability. Additionally, he expects to be responsible to transfer the knowledge<sup>[2]</sup>.

### **3.3 Hypotheses of relationship between psychological capital and knowledge transferring based on mediation of knowledge transferring will**

According to above analysis, the paper put forth hypothesis H2.

H2: the psychological capital is positively relevant to the knowledge transferring based on the mediation of the knowledge transferring will.

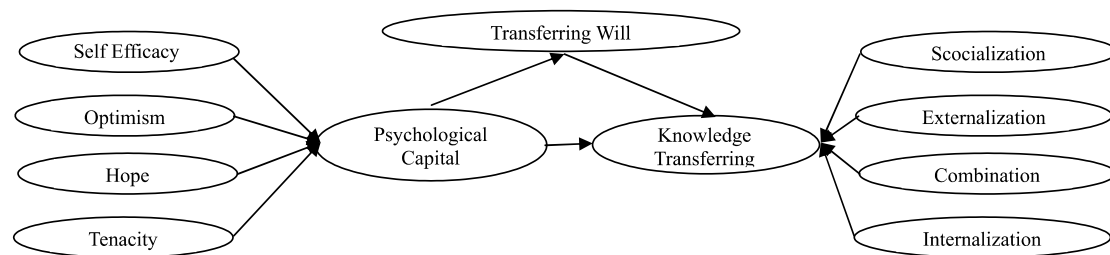
H2a: the self efficacy is positively relevant to the knowledge transferring based on the mediation of the knowledge transferring will.

H2b the optimism is positively relevant to the knowledge transferring based on the mediation of the knowledge transferring will.

H2c: the hope is positively relevant to the knowledge transferring based on the mediation of the knowledge transferring will.

H2d: and the tenacity is positively relevant to the knowledge transferring based on the mediation of the knowledge transferring will.

According to above hypotheses, the paper conceived the explaining structural model of the influence path between the psychological capital and the knowledge transferring based on the mediation of the knowledge transferring will. It is shown in Figure 2.



**Figure 2 The Explaining Structural Model of the Influence Path Between the Psychological Capital and the Knowledge Transferring Based on the Mediation Effect of the Will**

## 4 Influence Mechanism of Psychological Capital Based on Knowledge Transferring Ability

### 4.1 Influence of Knowledge Transferring Ability

The will and motive decide whether the knowledge transferring take place. However, the ability decides whether the knowledge transferring is frequently. In 1996, Grant indicated that the effective operation of the knowledge transferring depend on the will and ability of both parties in the knowledge transferring<sup>[24]</sup>. In 2000, Nonaka indicated that the individual with the subjective will of the knowledge transferring is not enough, and he must have the ability of the knowledge transferring that includes the spreading ability and the absorption<sup>[25]</sup>.

The stronger the spreading ability of the employee is, the better he express his experience and knowledge, and the more effective he spread his information and knowledge to the appropriate receiver with the appropriate way, channel combination and time. At the same time, he can help others to understand his knowledge. if the absorption ability of the employee is stronger, he will be identify and evaluate the knowledge more accurately. At the same time, he can absorb, store and apply the new knowledge more effectively.

### 4.2 Influences of Constituent of Psychological Capital to Knowledge Transferring Ability

In the knowledge transferring, the individual with high level of the self efficacy is easier to realize his object, and faster to absorb the knowledge and establish the healthy social network. Therefore, the successful experience and the healthy social network can strengthen his psychological capital and enhance the knowledge transferring.

The level of the optimism influences the expectation of the employee to the future new knowledge and affects him to regulate his knowledge transferring behavior continuously under the anxiety in order to cope with the organizational change. The optimistic employee will be initiatively responsible for the knowledge transferring, transfer the knowledge in the positive way, be willing to accept all kinds of challenges, and make a long term success through the self motivating.

The hope includes the will and way to do something. The will of the knowledge transferring mean the motive and the decision that cincentive the individual to realize the knowledge transferring object. The way is the method and tactics to realize the knowledge transferring. The way is the measure and tactic to to realize the knowledge transferring when he is faced with the challenges. The hopeful employee is able to set a specific and challenging objects, consider independently, and found the effective way to success. They have the strong request to the growth and the achievement, are usually creative. As a result, the exertion of the knowledge transferring ability will be stronger.

The tenacity employees own self-respect, self-confidence and ego stipulation, they will be optimism under the adverse circumstances. Their tenacity is helpful to conquer the difficulties, adapt to the environment, enhance the recovery and study initiatively. The tenacity employees not only renew their skill, knowledge and ability, but also are responsible for the knowledge transferring. Additionally, they often take the challenge of the adverse circumstances as the development opportunity, so they can accumulate much more experience, skill and knowledge.

### 4.3 Hypothesizes of Relationship between Psychological Capital and Knowledge Transferring Based on Mediation of Knowledge Transferring Ability

According to above analysis, the paper put forth hypothesis H2.

H3: the psychological capital is positively relevant to the knowledge transferring based on the mediation of the knowledge transferring ability.

H3a: the self efficacy is positively relevant to the knowledge transferring based on the mediation of

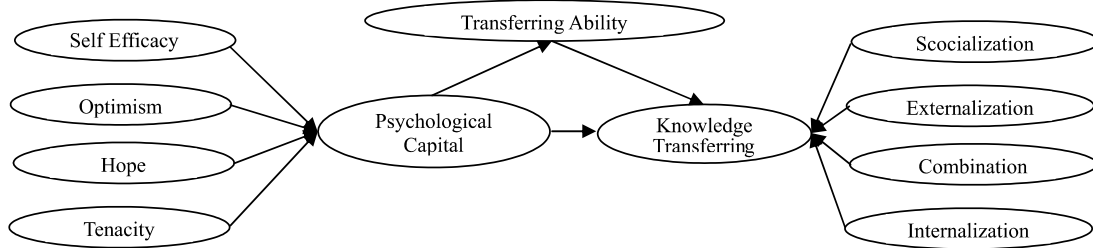
the knowledge transferring ability.

H3b the optimism is positively relevant to the knowledge transferring based on the mediation of the knowledge transferring ability.

H3c: the hope is positively relevant to the knowledge transferring based on the mediation of the knowledge transferring ability.

H3d: and the tenacity is positively relevant to the knowledge transferring based on the mediation of the knowledge transferring ability.

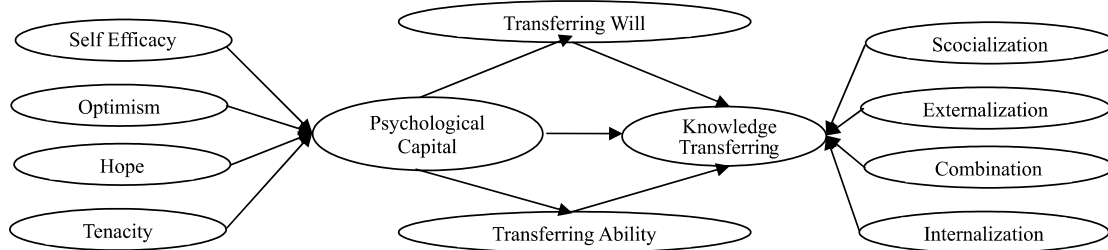
According to above hypothesizes, the paper conceived the explaining structural model of the influence path between the psychological capital and the knowledge transferring based on the mediation of the knowledge transferring ability. It is shown in Figure 3.



**Figure 3 the explaining structural model of the influence path between the psychological capital and the knowledge transferring based on the mediation effect of the knowledge transferring ability**

### 5 Comprehensive Influence Model between Psychological Capital and Knowledge Transferring Based on Mediation Effect

According to above hypothesizes, the research can be concluded the follows. Firstly, the psychological capital is very important to the knowledge transferring. Secondly, the psychological capital is positively relevant to the knowledge transferring. Thirdly, the psychological capital is positively relevant to the knowledge transferring based on the knowledge transferring will. Fourthly, the psychological capital is positively relevant to the knowledge transferring based on the knowledge transferring ability. The explaining structural model of the comprehensive influence path of the the psychological capital to the knowledge transferring is shown in Figure 4.



**Figure 4 The Explaining Structural Model of the Comprehensive Influence Path Between the Psychological Capital and The Knowledge Transferring Based on the Mediation Effect Of the Knowledge Transferring Will and Ability.**

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# Countermeasures of Developing Higher Vocational College Students' Practical Ability

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**Abstract:** In this paper, we put forwards four countermeasures to deal with the problems existed in developing the current higher vocational students' practical ability. The first thing is to construct a distinctive mode of talent training. Secondly is to attach importance to practice teaching, which means investing more in practice teaching. Thirdly is to strengthen the double-qualified faculty team. The last thing is to develop the self-awareness of practical ability training, so as to achieve the goal of higher vocational education more effectively.

**Key words:** Higher vocational colleges; Practical ability; Countermeasure; Logical analysis

## 1 Introduction

Higher vocational education must base on market and serve the society to cultivate students' application competence and professional skill. It aims at training skilled talents for production, construction and service line. The feature of skilled talents is that they have higher occupation skills and practical abilities. In order to achieve this goal, higher vocational colleges need to strengthen the training of students' practical abilities. Meanwhile, with the rapid development of social economy, culture, science and technology, there are more demands for Higher Vocational College Students. For example, the strong innovative ability and entrepreneurship ability, the much stronger practical ability, and the ability to achieve zero distance employment and so on becomes more and more important. In this conditions, how to meet the needs of social development and cultivate the practical ability of vocational college students has become the urgent problems, which is our concern. In recent decades, the developed countries have made a lot of effective attempts and gained rich experiences in this respect.

### 1.1 Six core skills approved by Confederation of British industry, department for education and employment and the qualifications and curriculum Department

In 1998 the British government pointed out in the document *towards the success of the qualification*, "technology is the key to everyone's starting point. Key skills support personal occupation career change and transition. For those who have a solid foundation of key skills and the ability to update these key skills for people, for their work in the leading and surpass others." At present, the Confederation of British industry, department for education and employment and the qualifications and curriculum Department approved six core skills include communications, digital information technology, application, to cooperate with others, improve learning and enhance the performance and the ability to solve problems.

### 1.2 Franz- Josef Kaiser's views

Franz- Josef Kaiser et al divided the key ability into five aspects: the explicit subject ability, the independent ability and the ability to participate, the group or social competence, the system or process capability, the ability to reflect.

### 1.3 Some viewpoints on China

In the *national skills to revitalize the strategy* research report by Chinese human resources and social security department, the occupation core ability is divided into eight parts and called "eight core competencies", which includes: communication with others, digital applications, information processing, problem solving, self learning innovation, innovation and language application.

## 2 The Analysis of Current Chinese Higher Vocational Students' Practical Ability Training Problems

### 2.1 The school talent training mode is lack of characteristics

At present, the feature of Chinese domestic higher vocational college talent cultivation mode is the same as the ordinary higher education training model. Which means that the nation implements the same talent training policy, formulates unified specialty catalogue, teaching plan and teaching material, have same entrance exam and distribution of employment. The difference between them is that one is called college and the other is University. Under this system, this inevitably leads to the assimilation of



higher vocational training targets and that of universities. The direct consequence of this talent training mode is the lack of character and personality. Students having no consciousness and spirit of creativity is difficult to adapt to the market economy and the higher demand. Higher vocational education is to train applied talents, not design and development talents. The Chinese current higher vocational education is still backward and the teaching ideas are still affected by the traditional education thought.

### **2.2 The practice teaching link is seriously out of line**

Because of the influence of traditional education, the higher vocational teaching focus on making the students get the existing theoretical knowledge, not the development of students' practical operation skills and the ability to solve practical problems. It now appears that most of the contents are demonstrative and confirmatory and they are lack of modern new technology, new material, new technology, new equipment and other aspects of the latest results. In addition, the investment of the existing teaching equipment, educational funds, the practice base and experiment teaching condition are backward which makes the experimental level relatively low. So it affects the quality of practice teaching and it can not meet the requirements of experimental teaching. But as a higher vocational college, having no practice base is totally unacceptable. If there is no practice base for a long period, the students will be an armchair strategist. If they take on a new job, they will find themselves are lacking of practical abilities.

### **2.3 double-qualified teachers are in great need**

At present, the teachers in higher vocational colleges are mainly college graduates, most of whom are lack of social experience. Their practical ability in teaching, in practical training and on-the-spot guidance are in a weak position, which hinder the realization of training aim of higher vocational education. As a result, the Ability-Standard principle can not be effectively implemented. I think there are two reasons for the lack of double-qualified teachers. The first thing is that the introduction of higher vocational teachers lays too much stress on education. Blindly pursuit of high academic qualifications and neglect of experience and skills leads directly to the disconnection between teacher and practice teaching. The second thing is that the participation of enterprise in the higher vocational teachers training is too weak. the shortage of communication between schools and enterprises leads to lag in technology, therefore, teachers can not keep ahead of the latest industry developments and make full use of this congenital optimal practice platform.

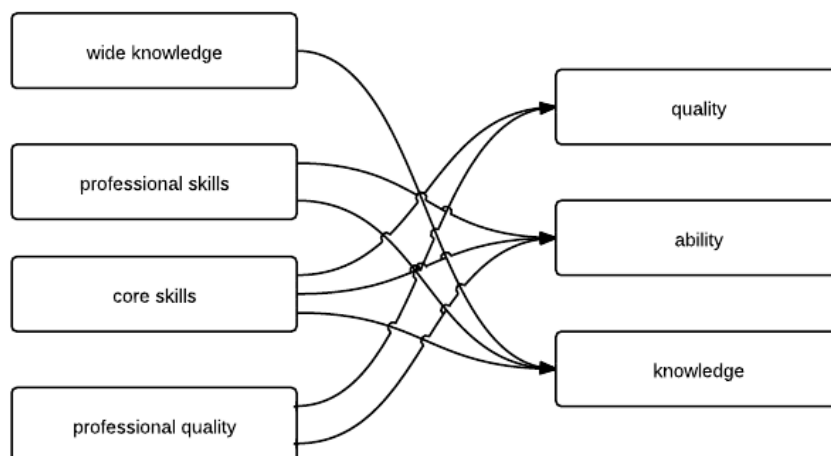
### **2.4 Higher vocational students ' own problems**

As the target of practical activities, Higher vocational students are the embodiment of the practice teaching effect. And their attitudes to the practical activities directly affect the teaching. There are several problems for higher vocational students. First thing is the lack of consciousness of self practice. Most students are dissatisfied with the social practice activities or arrangement of practice by their schools. They complained that the internship platforms offered by their schools hook their professions rarely. In fact, they think that those not only can exercise little but also are a waste of time and the research funding given by the schools is too little. Although these complaints are in some sense connected with the organization by their schools, however, it reflects the current students' low self-consciousness and enthusiasm in practical activities and practical ability. The second problem is the lack of professional skills and practical abilities. The higher vocational students have some common problems such as lacking of professional knowledge and professional skills when they graduate. That's because their cultural bases are not high when they enter the colleges and their subjective learning initiatives are poor. Those directly lead to low appliance ability to analyze and solve problems after their graduation.

## **3 Training Students' Practical Ability Countermeasure**

### **3.1 Constructing characteristic talents training mode**

The purpose of the higher occupation education training should cultivate the students to adapt to the post groups needed for comprehensive practice ability. It not only emphasizes the social role but also make up the absence of individuality.



**Figure 1 Requirements of Characteristic Talents**

### 3.1.1 Curriculum

The curriculum should establish the "wide base, flexible module" teaching pattern, which means to encourage students both to master broad knowledge and critical ability and to strengthen their working ability.

### 3.1.2 Teaching methods

Instead of the one-way indoctrination and centering on subject teaching mode, cultivating the students' practice spirit and practice ability through training should always been implemented. At the same time, in order to highlight the cultivation of students' practical ability, the schools should integrate their subjects, knowledge and abilities and try to carry out the two-way education process and comprehensive education method.

### 3.1.3 Talents training direction.

We should establish the compound talents training mode so that students can really meet the needs of society. In order to achieve the goal, the following specific measures should be adopted. The First thing is to strengthen the teaching and training of foreign language, computer and to prominent English listening, speaking and professional foreign language and computer skills training. The second thing is to pay attention to the students' communicative ability. by offering humanities and social science elective courses, organizing seminars and other activities, the students can learn communication. In this way, they can have the communication abilities of language literal expression, teamwork and social activities. Thirdly, it is important to open the employment and career guidance curriculum, so that the students can really meet the needs of the society.

### 3.2 Attaching the importance to practice teaching and strengthening practice teaching investment

Higher vocational schools should arrange proper practice teaching time and content of courses. To meet to changes of the talent demands for the society, some technical certification examination should be combined with the integrated practice teaching courses, which can make the students both learn a certain skill and obtain the corresponding certifications in the process of practice. Meanwhile, to improve the practice teaching environment and to increase the input of practice teaching are necessary. The schools should place importance on the practical skills training. Cooperating with some of the local industrial and commercial enterprises can establish a practical teaching base that includes research, producing and teaching. The outside school bases are not only carrier of practice and production, but also the link between integration of theory and practice, teaching in combination and production. For example, schools can cooperate with related enterprises in scientific research and production and actively participate in the enterprise production planning, which can make them sides benefit from it. The enterprises are willing to accept the teaching practice and social practice. Those are mutually beneficial to the schools and the enterprises. Therefore, the schools can not only solve the students' problems of the production and practice, but also make the best use of talents and promote new technologies.

### 3.3 Strengthening" double type" teacher team construction

Double-qualified teachers' training is the guarantee of education quality. It's an effective way to achieve the training goal, highlight the characteristics of higher vocational education, improve the

standard of teachers. The school can arrange the teachers for professional practice and study in the enterprises, widely attract and encourage engineers and qualified technician of enterprises, managerial talents and personnel with special skills to come to the colleges as part-time or special hired professors and hiring the distinguished teachers, business and community experts as part-time professors, to improve the teachers' practical abilities. We call this "send out to study, come to teach". Only in this way can we improve the standard of teachers and only the teachers' practical teaching level is improved, the students' ability of practice is improved. Thus the quality of the practice teaching can be ensured.

### **3.4 Strengthening the practice ability of the students in the independent planning consciousness**

The students are the object of practical ability formation and development because any external culture and shaping behavior eventually need the students' efforts to change themselves. Students should have the awareness of self-development and planning and give play to their subjective initiative. In order to achieve that goal, teachers should timely and purposefully teach the students the importance of learning and practice, so that the students can harvest through it and they will have a sense of accomplishment psychologically, which stimulate their higher learning and the practical desire. At the same time, the schools should encourage the students to establish professional associations to enrich their extracurricular activities, understand the professional knowledge and to build their interest in science. In this way, the students can greatly enrich their professional practice skills, organizational skills, and exercise ability of public relations, information search and communication ability. In addition, the school and teachers should organize students to visit factories and enterprises to enable students to understand the gaps between professional knowledge needed in production and in textbook so that they can study hard to improve their practical ability and become truly useful technology applied talents.

## **4 Conclusion**

The fundamental task of the vocational education is to improve the vocational ability, which covers the employment ability and adaption to the change of occupation ability. At present, the contradiction of the shortage of high skill talents needed by the market and the difficulty of the college graduates' employment is that occupation ability training in higher vocational colleges is not implemented and the students occupation ability can not meet the requirements of employers. To change this situation completely, the vocational colleges urgently need to establish employment oriented occupation education systems and to take practical steps to strengthen the occupation ability training so that each student has the ability to enter the market competitively. Higher vocational school should construct the unique talents cultivation mode, attach importance to practice teaching, strengthen practice teaching and the double-qualified faculty team. Higher vocational students' Students should have the awareness of self-development and planning and give play to their subjective initiative. Only in this way can we cultivate skilled talents that can serve the community.

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# Research on the Private Financing in China

## --Analysis of the Effectiveness of Financial Reform in Wenzhou of China

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**Abstract:** Since April last year, a large number of bosses in Wenzhou of China have ran away or committed suicide. It is because they had borrowed the loan sharks and couldn't pay back the several hundred million Yuan. As the similar things happened again and again, Private lending crisis in Wenzhou burst out. The government had to take measures to prevent the spread of the crisis, since the crisis do tremendous damage to the financing market and the real economy. On March this year, the government announced to set up financial reform pilot area in Wenzhou to lead private financing to make standard development. Private financing, which was always trading secretly, is now becoming open to the public. In this text, we will discuss the cause of private lending crisis and make a detailed analysis of this financing reform to see the effectiveness and shortages of it and the long prospect of private financing.

**Key words:** Wenzhou; Private financing; Private lending crisis; Financial reform; 12 task of financial reform

### 1 Introduction

The global economic crisis has a bad effect on the small and medium-sized enterprises in China. These enterprises cannot get enough capital from the commercial banks and other formal finance institutions, so they turned to private financing for help. In this case, private lending came into crazy. Finally the private lending crisis broke out. The government has to take measures to resolve the crisis. In the first half of this year, the government set up Wenzhou city experimental area of comprehensive and innovative finance to solve the severer situation.

Private financing isn't a new research direction, many scholars have written many articles to show their opinions about it. As the new round financing reform takes place, there are some new questions and highlights come out. So in the new situation, we need to reconsider this question. In this essay, we will focus on the sunny development of private financing. For the reform in Wenzhou, making an analysis of the policies and searching the real meaning for eliminating crisis. And finally, I will give some advices for the further development of private financing.

### 2 The basics of Private Financing in China

#### 2.1 What is private financing?

Private financing is a financial activity which is between individual creditors and investors, outside of the national financial institution, and with the purpose of getting paid backs a high interest, gaining access to capital and paying the promised interest. Private financing, with its flexibility and convenience, elasticity of interest rate and diversification of financing characteristics; became one of the important means of financing for enterprises, except for formal financial institutions. There are four ways of private financing, namely, private debit and credit, negotiable securities financing, bill financing and internal financing, among which private debit and credit is the most traditional way. Usurious, as one of the main form of private debit and credit, is mainly used for the individual and private enterprises to satisfy the need of turnover in production.

#### 2.2 Why private financing can make a rapid development in China?

As we can see, private financing means the borrower has to pay a much higher interest rate. Even though, there are still a lot of enterprises choosing it. In fact, this is not a strange thing, and we can analyze from four aspects. Firstly, as borrowers, enterprises lack the sense of credit. Subject to the operating conditions and level, they cannot get enough money from commercial banks, and this means they don't have enough money to meet the need of reproduction. In this case, they have to turn to private financing for help. Secondly, the commercial banks are not willing to provide loans to the small enterprises whose operating and financial risk are very high. Thirdly, with the development of our

society, Chinese have more and more idle funds, while there era not enough investment channel. Private financing provide people a way of getting high paybacks. The temptation is hard to resist. And lastly, private financing is very convenient and easy to operate; enterprises can get the loans in a very short period of time. (Zhou Chuang, 2005)These features can meet the need of the enterprises which need short-term financial support. Indeed, private financing has developed rapidly. However, without the legal and standard system, it must involve much hidden danger. Once the hidden danger was exposed, a lending crisis is to break out.

### 3 Private Lending Crisis in China

#### 3.1 Analysis of private lending crisis

Taking a look of the Wenzhou private lending crisis, with the analysis of the current economic situation, we can make a conclusion that small and medium-sized enterprises will become the main demanders of private lending. The report of National Association of Industry and Commerce shows that nowadays it's very difficult for small and medium-sized enterprises to raise money. 90% of those enterprises don't have any credit relationships with any bank. And for micro enterprises this data is up to 95%. Under such great pressure, those enterprises can only take a risk to private lending; however, this measure has no difference with quenching a thirst with poison. The high interest rate is just like a rolling snowball which becomes bigger and bigger. Finally those enterprises got bankrupt, and CEOs of those enterprises all absconded with the money, which shocked the whole country gave the whole society a negative influence. Table 1 and figure 1 show the comparison of Wenzhou private lending and bank borrowing. By the end of the first half of 2011, the whole scale of Wenzhou private lending has reached 1100 hundred billion. During the same period, banks' saving accounts fell sharply and their appeared a recession of bank debit and credit.

In practical operation many people specialize in funds circulation business, which is also known as interest speculating. That is also the reason why the whole private lending chain in Wenzhou become longer through reselling and speculating, and the interests also become higher. As the result of the survey which was made by the People's bank of China Wenzhou central branch shows, there are 89% of individual and 59.67% enterprises that were involved in private lending. (We can see from the diagram about the scale of Wenzhou private lending and groups involved in it.) It is not difficult for us to find out that many of the entity companies didn't use those private lending in their own business when they got them. Those private lending funds and capital even have no access to the entity economy, and most of them were used in the speculation of capital and real estate and so on, which made the economy of the whole society get worse than ever. To see from the perspective of macroeconomics, private lending crisis can be treated as a terrible credit crisis, which is a crowning calamity for the development of local entity economy and finance.

**Table 1 Comparison Between Private Financing and Bank Loans in Wenzhou of China**

Year	The average rate for folk lending	Private lending scale	Benchmark one-year interest rate on loans	Outstanding bank credit loans
1980	34.80	9	12.000	7.16
1983	26.40	10	12.000	8.65
1985	36.00	15	12.000	13.83
1988	45.00	50	17.280	32.03
1990	34.80	85	17.280	42.25
1995	30.00	110	14.930	167.54
1998	26.40	180	7.560	369.36
2001	18.00	240	5.850	708.11
2003	10.60	300	5.310	1312.94
2004	13.04	380	5.580	1534.24
2005	12.16	420	5.580	1711.09
2006	10.92	450	5.850	2205.64
2007	11.70	550	7.730	2783.72
2008	14.37	580	6.525	3306.13
2011	24.40	1100	6.310	6023.00

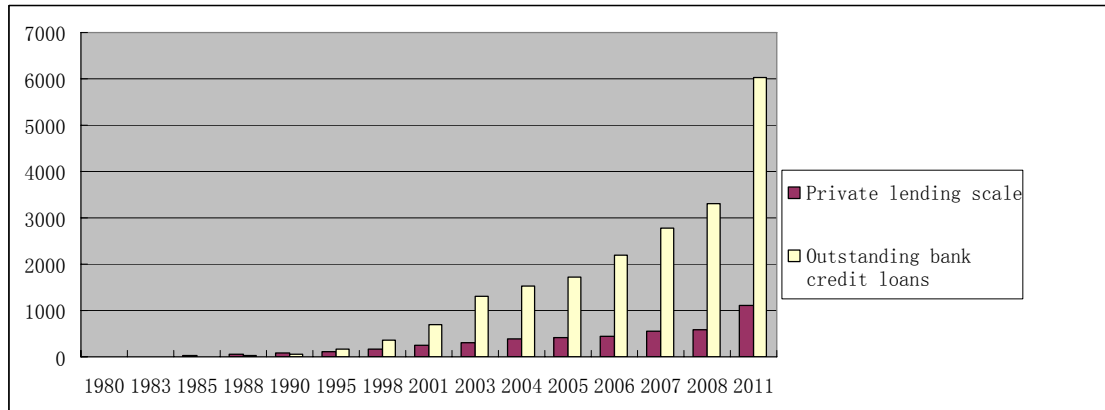


Figure 1 Comparison Between Private Financing and Bank Loans in Wenzhou of China

## 4 Interpretation of This Financial Reform in Wenzhou of China

### 4.1 The main direction and task of the financial reform

The major problem faced by private lending fundamentally is the problem of standardization. If private lending can be standardized as bank credit, there would not be a private lending crisis which has caused such a great damage. To many of those small and medium-sized enterprises who are eager to capital, the standardization of private lending somehow may decide their destiny.

On March the 3rd, 2012, Premier Wen Jiabao chaired a State Council executive meeting and decided to establish Wenzhou city experimental area of comprehensive and innovative finance. The conference approached the implementation of “Wenzhou city experimental area of comprehensive and innovative finance program of Zhejiang province”, and made requirements and command about the innovation of system in order to build a matched diversified financial system of today’s economic society and makes an improvement in financial service, which can also improve the ability of taking precaution of financial risks and the who financial environment. It will also provide precious experience for the financial reform of the whole nation.

The conference also set 12 main subjects for the comprehensive reform of Wenzhou financial environment. We can make some explanation about these 12 subjects to get a comprehensive understanding of how much development space and guidance are given to the private lending by the government. These 12 subjects can be concluded and divided into 3 points:

Firstly, make a standardization of private lending organization and the direction of investment, including standardize the development of private lending and accelerate the development of new types of financial organizations. The government should encourage and support local private lending organizations to join the reform of local financial institutions; and establish or participate in the equity of village banks, loan companies, rural fund corporations and other new types of financial organizations in accordance of the laws. Small loan companies with certain conditions can be reformed as village banks. And make research on individual overseas investment experimental spot to explore how to establish a standardized and convenient way of direct investment. These subjects show that the nation has changed its attitude and policies of private lending. As its own development, private lending has become one of the important means of social financing, so that we cannot restrain its development or even destroy it. It is too late for the country to take measures of usurious, which is one of the main forms of private debit and credit, And Now we can only standardize the cost of private lending by policies to make it go on a normal track. And only in this way can we take the most advantage of private lending.

Secondly, make special financing platform for small and medium-sized enterprises. The government hopes to provide those enterprises with a larger platform with the use of bunds, new types of financial products and capital markets. For the small and medium-sized enterprises financing problem, which is also one of the difficulties for the development of those enterprises and national economic growth, the government should take full advantage of financial market and new financial tools to give those enterprises a wider and safer resource of financing.

Thirdly, promote the development of both small and medium-sized enterprises and private lending organization by making efforts in controlling the risks through market, government and society. The government will take actions to strengthen the establishment and construction of social security system; also provide reinsurance and improve the function of government supervision. And the government will

control the risks of private lending in the possible maximum degree to make sure that there will be a “win-win” program for both lenders and borrowers.

#### **4.2 Some problems existing in this reform**

It's obviously that this financial reform in Wenzhou plays a very important role in the process of the development of private lending. Apparently the central government has realized private lending has a great impact on the growth of enterprises and the development of our national economy. However, whether the current crisis can be stopped spreading just through this reform, and if the problems of private lending can be solved, these questions urge us to make a more specific analysis on this reform.

By analyzing the twelve tasks of this reform, we find that there are still some problems that can make an impact on the effectiveness of the policy:

(1) As we can see, these tasks cover a wide range. It ranges from standardizing the development of private lending to strengthening the establishment and construction of social security system. However, most of them are just given some guidelines in principle, and lack in specific operating plans, which means these tasks may face the difficulty of feasibility in practice. For example, it refers to making a development of asset management organizations. In fact, this proposal has been proposed several times in many meetings, while it haven't been solved and carried out so far. This means it seems a little difficult to carry out the plans in Wenzhou.

(2) Permission of Personal overseas investment may bring more risks to the national market. As the launch of personal overseas investment in Wenzhou, many capitals in other area in China will be attracted to rush into this area and then be invested overseas. No wonder it will increase the difficulty for capital management and even cause capital flight, impacting our domestic economy. So it's very essential to avoid blind personal overseas investment. This requires the government establish relevant Warning and supervision measures.

(3) Whether the Support for solving the problems in Wenzhou is enough. Thumbing through some of materials of this financial crisis, we can find that the government in Wenzhou used to drafting a document, which was called the overall scheme of establishing a comprehensive experimental area in Wenzhou. The local government has submitted it to the government of Zhejiang province and central government. This document has presented many specific pilot projects of reform, which are quite different from the tasks given by the central government. The local government in Wenzhou submitted eight specific sub schemes, which include establishing the firm of management and service of private capital, making a development of Micro-credit companies and Private Equity Investment Industry, accelerating the shareholding reform of rural financial reform, and establishing local financial regulation. There are many intersection and difference between the two documents. What's more, five specific plans were not approved in the documents of the central government. We can conclude that the financial reform doesn't give enough support to what Wenzhou really needs.

(4) There may be legal risk. The second task of this reform is accelerating development of new financial organizations. The government encourages and supports private capital to participate in the reform of local financial institution and set up according to law or take stakes in new financial organizations such as rural banks, Finance Corporation and rural fund cooperatives. However, we can find no relevant laws which can be the foundation of setting up or taking stakes in rural banks. on the contrary, private capital is banned from setting up banks in the Law of the People's Republic of China on Commercial Banks. This contradiction is bound to cause loopholes. As we can foresee, once there is a flaw, it will be made use by someone, and deepen the disorder of financial market,

We all consider the problem of difficulty of financing in middle and small enterprises as the background and one of the immediate causes of this private lending crisis, so difficulty of financing. Small and medium-sized enterprises must have enough living space and market competitiveness. However, many enterprises have the problems of poor technology and lacking market advantage, and these problems restrict the development of these enterprises radically, while only financing to expand production cannot solve the problems. We can see the favorable terms about financing in the document, but I think the government should do more to guide Small and medium-sized enterprises to turn into technology intensive enterprises. The problem of difficulty of financing in middle and small enterprises can be solved in this way. In turn, the enterprises no longer face the financing problems; since they can operate well, private lending will no longer go wild.

## **5 Prospects of Private Financing and Some Proposals**

### **5.1 Prospects of the development of private financing**

Through the above analysis, it can be concluded that is this financial reform is of important symbolic significance. Private financing which is discouraged in a long-term in china can, it is expected to step into the formal channels of the financial market in china. Since we have analyzed many problems in the reform, the effectiveness of this reform is needed to be proved. Anyway, we can use normalization, legitimation and marketization to describe the future direction of private financing.

### **5.2 Some proposals to promotion of private financing**

In order to accelerate the elimination of lending crisis and maintain the healthy development of the real economy, we can do more from these aspects.

1) Speeding up the marketization of interest rate. Out of worry about short-term finance security, this reform didn't refer to this question. In the short term, private financing is brought into government supervisory and regulation. On one hand, it can reduce the risk of interest rate fluctuations, on the other hand, it reduce the possibility to carry out marketization of interest rate. In the long term, the marketization of interest rate is the core of the steady and efficient operating of financial system. as the biggest problem in formal financial system of China, bank monopoly decrease the efficiency of the whole society. So the marketing operations of interest rate should be the core in further reform. Without operations of market-oriented interest rate, banking monopoly may be more severe after private capital taken in formal channels.

2) The legitimacy of private financing, we should notice that private financing is just enclosed in the public; the government hasn't admitted its legitimacy. This is because private lending has showed more negative than positive impacts, and it still has a lot of problems which we can not solve in a short time. However, on a longer term basis, private financing will be brought into law. Since only regulated and standardized in the law, can private financing develop more healthily.

3) Guiding Small and medium-sized enterprises to turn into technology intensive and capital enterprises. For the enterprises which can adapt to the changing market, the government should support is development; for the enterprises which can not adapt to the changing world, let them be eliminated. The government should improve the mechanism for rewarding independent innovation to guarantee the international competence. Once the profit of these enterprises can be protected, it won't be easy for private financing to gain too much from the real economy.

4) Strengthening the social ensure system. As an essential part of preventing risks, Social security system can decrease the happen of crisis, and reduce the loss. So it's important to perfect social security mechanism; it will support the healthy development of enterprises and minimize both losses and market dislocation. (Liu Zhihao, 2007)

## **6 Conclusion**

This lending crisis in Wenzhou of China exposed the problems of private financing and the vulnerability of our economy. The financial reform will change this situation to some extent. But the effectiveness of the reform has to be in a long term, we hope that there can be more effective measures to be taken, so that private financing can be regulated reasonably, promoting the growth of small and medium-sized enterprises and the development domestic economy.

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# Research on Real Estate Bubble in Wuhan City of China

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**Abstract:** The real estate industry has been a hot issue of domestic and foreign scholars. In this paper, we studied the theoretical relationship between the real estate and the bubble economy and use the empirical analysis method to explore the real estate market in Wuhan, based on data from 2000 to 2009. After defining and analyzing the Wuhan City real estate bubble, we find that the Wuhan City real estate market may be the existence of the bubble. Finally, this paper proposals some policy recommendations based on the analysis results.

**Keywords:** Real estate; Bubble economy; Recommendations

## 1 Introduction

The real estate industry has always been a hot topic. The real estate operation relates to the healthy development of the national economy. Since 2003, the house prices in China are rising. This overheating caused great social repercussions and great attention by the government. From the government perspective, the government has issued a series of real estate policy to control the overheating house prices. The State Council promulgated in 2003 on the 18th file clearly to promote the real estate market is healthy and sustainable development requirements. In 2005, "state eight" was first proposed to take the appropriate measures to effectively inhibit the fast rising housing prices. In 2006, "state six" made the appropriate regulation, in terms of land, taxation, foreign investment and access to credit, housing structure and the real estate market trading order. Since then, the government unveiled the "state eleven" (2010) and the "new state eight" (2011). We find that over the last decade, the government has been to increase the regulation of real estate policy. But in fact, from the perspective of ordinary people, the effect is not ideal. In the Two Sessions held in 2012, the house price issue is still a hot topic discussed. On the other hand, Premier Wen Jiabao pointed out that the current prices are far below and income to match in the government work report. Wen stated that the current house price has not yet reached a reasonable range, so the regulation of the Government will not relax.

In this context, I believe that a correct understanding of the real estate industry development and systematic analysis of the regional real estate bubble has great significance. The paper selected Wuhan City as a research object. The government work report in 2004 proposed the Rise of Central China. On the other hand, Wuhan will play a very important role in promoting the Rise of central China plans. During this period, the economic development of Wuhan City has made considerable progress, but we can easily find the Wuhan City housing prices is all the way up. So our qualitative and quantitative research on real estate issues in Wuhan has a very important theoretical and practical meaning.

## 2 The Theoretical Relationship between the Real Estate and the Bubble Economy

The bubble economy is caused by the excessive growth of fictitious capital. When the value of assets is far more than the real economy, the lack of economic support of the real economy will lead to the bursting of the speculative market, which led to the bubble burst. After we understand the concept of the bubble economy, the concept of real estate is put into the bubble economy so that we can understand the connotation of the real estate bubble. The real estate bubble is due to excessive speculation, resulting in prices has seriously deviated from its fundamental value. When the current price and its fundamental value deviated from to a certain extent, the whole industry will collapse, it may experience a long-term recession. Obviously, the real estate bubble is more common in a price bubble in the bubble economy, and then the society should be how to detect the real estate bubble? Many scholars have carried out on the measure of the real estate. Dennis (2002) has built a dynamic model analysis of the impact factor of the prices from the short-term and long-term two levels. Kazuo (1995) take Japan's bubble economy as the object, verify that the expected real estate bubble. Lee (2005) studied from the perspective of system dynamics, finding that positive feedback mechanisms of the real estate demand and prices led to a real estate bubble. In the research literature for methods, Noguchi, Yukio (1987) measured the real estate bubble with the income method. Kiyohiko, Nishimura (1990) measured the local real estate industry using the index method. Hing(2001)established the econometric model to measure the bubble. At the same time, more and more scholars using the indicator analysis methods to measure the real estate

bubble. The main indicators include domestic industry profit margins, price earnings ratio, the proportion of the community of all fixed assets investment in real estate investment, real estate class in the proportion of loans in total loans and so on. If an industry's average profit margin is higher than the status quo can be maintained for more than 30 percent of other industries and more than three years, then we can assume the existence of a bubble. In developing countries, the price earnings ratio should be in the 3-6 range. Some scholars believe that if all loans in the developing countries the proportion of real estate loans is over 5%, indicating mild foam. In accordance with the industrial division of labour and the proportion of real estate as a class of tertiary industry in the construction industry to the total investment proportion less than 10% is appropriate. If the ratio exceeds 20%, it indicates that the national economy a serious bubble and the emergence of real estate dependent tendency.

### 3 The Real Estate Bubble in Wuhan

In order to make our analysis more convincing, we selected 2000-2009 data from the Wuhan City Yearbook. We intend that the development of class indicators from the real estate industry, real estate supply and demand indicators, real estate, financial indicators, the indicators of real estate investment class and the Wuhan City standard of living indicators described.

#### 3.1 The real estate industry development in Wuhan

**Table 1 The Development of Real Estate Industry**

year	The real estate value	GDP
2000	30.81	1206.84
2001	37.08	1335.40
2002	53.74	1467.80
2003	64.48	1622.18
2004	77.15	1882.24
2005	86.83	2261.17
2006	105.92	2679.33
2007	134.14	3209.47
2008	236.59	4115.51
2009	283.95	4620.86

From the data in Table 1, we can easily see the economic development of Wuhan City has achieved rapid development in the 2000-2009. But along with this economic growth, we found that the real estate share of GDP has also increased year by year. The proportion rose from 2000 accounting for 2.55% to 6.14% in 2009. From that point on we can speculate, Wuhan City, the real estate industry plays a vital role in the economic development of the region.

#### 3.2 The real estate supply and demand in Wuhan

From the perspective of economics, supply and demand determine the price. So in order to understand the connotation of the current prices, we first need to understand the supply and demand on the market for real estate. In order to more clearly and directly reflect the supply and demand of the real estate industry in Wuhan City, we have selected Wuhan City, real estate sales as indicators reflect the needs of area as the supply indicators reflect completion of the real estate development.

**Table 2 The Real Estate Supply and Demand**

year	Real estate sales	Vacant area	Completion of the area	Sales value
2000	359.52	231.83	425.70	64.09
2001	408.85	288.20	499.60	74.15
2002	450.27	308.36	522.70	86.81
2003	542.79	184.12	600.24	112.46
2004	658.08	121.71	608.91	151.19
2005	914.06	162.14	722.25	279.86
2006	960.88	180.52	776.67	354.53
2007	1135.41	131.88	811.62	529.56
2008	732.07	215.43	768.23	350.01
2009	1086.99	214.14	824.58	579.22

The data show that Wuhan City real estate market supply and demand reached a balance point between 2003 and 2004. But after 2004, it has been a shortage of real estate situation. As a result, the real estate sales increased substantially. On the other hand, we can observe the trend of vacant housing area of Wuhan City real estate market has been fluctuations.

### 3.3 The real estate loans in Wuhan

**Table 3 The Real Estate Loans**

Real estate loans	Total loans
18.53	1196.92
23.36	1380.94
34.09	1698.14
37.96	2138.62
51.39	2481.17
89.78	2719.87
110.15	1162.82
102.79	1363.24
93.01	1620.68
53.26	1904.44

Based on historical experience, in developing countries, if the real estate loans accounted for more than 5%, the bubble may exist. We can calculate the proportion of Wuhan City real estate loans from 2000 to 2009. The calculations show that in 2006 accounted for 9.5% in 2007, accounting for 7.5%, accounting for 5.7% in 2008. We conclude that in the past few years, Wuhan City has a real estate bubble, especially in 2006.

### 3.4 The real estate investment in Wuhan

**Table 4 The Real Estate Investment**

Total fixed asset investment	Real estate investment
461.93	101.31
508.44	115.34
570.43	132.50
645.06	169.55
822.20	233.30
1055.18	297.99
1325.29	366.15
1732.79	459.75
2252.05	560.36
3001.10	778.59

According to the proportion of fixed investment in real estate development and investment can also be good to explain the real estate market bubble. The calculation results based on data from 2000 to 2009, we found that during this 10 years, the proportion of real estate investment is at least 22 % (in 2000). We conclude that there is the current high proportion of real estate investment in Wuhan City. From another point of view also illustrates the Wuhan City, may exist the behavior of the real estate speculation.

### 3.5 The standard of living in Wuhan

**Table 5 The Standard of Living**

year	Per capita disposable income
2000	564.27
2001	609.53
2002	684.02
2003	750.36

2004	846.40
2005	904.14
2006	1030.00
2007	1196.47
2008	1392.70
2009	1532.08

During 2000 to 2009, the per capita disposable income in Wuhan is growing rapidly. In order to analyze whether the current prices putting pressure on the people of Wuhan City, also to test whether the Wuhan real estate market bubble, we choose the price earnings ratio as an analysis indicator. Due to changes in the price earnings dynamic, we choose the mean value. We found that the Wuhan City, price earnings ratio is in the range of (3, 6) during 2000 to 2009. The reason for this result may be the house price data we select are not able to dynamically reflect changes in real estate prices. On the other hand, it may be caused by a substantial increase in living standards.

#### 4 Conclusions

Based on the above analysis, we can easily find the Wuhan City real estate market may be the existence of the bubble. Of the above problems, we propose the following can contribute to the Wuhan City, real estate found in health countermeasures.

1) Government should provide safeguards

To solve the real estate bubble is not a short-term project. The government should introduce policies and laws and regulations, and to provide more "supply" to adapt to its growing "needs". For example, to provide affordable housing, etc.

2) Improve the diversification of investment channels

From the above analysis, we find that the proportion of investment in real estate is very high. The reasons leading to the emergence of this phenomenon is too monotonous social investment channels. As a result, the real estate market has speculation behaviors. The Government should address the investment channels to achieve a wide range of social investment, to avoid the behavior of real estate speculation.

In this stage of the study, we found that the bubble in Wuhan exists. In the next phase of the study, we will work hard on establishing a clearly quantitative measure of the real estate bubble mechanism.

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# Research on Financing Risk Control Based on the Technology and Finance Operation Mode\*

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**Abstract:** The organic combination of the finance and technology will greatly improve the speed and efficiency of transforming scientific and technological achievements into real productive forces. With the development of economy, science and technology enterprises demand for more and more funds and finance more and more frequently, which will produce some risks. Based on the service operation mode of technology and finance, this paper analyzes the formation factors of the financing risk, forms financing risk index system of the technology enterprises, and constructs financing risk evaluation model of technology and finance using the artificial neural network. Finally this paper puts forward a series of financing risk control measures to technology and finance and provides decision-making reference for the government and enterprises.

**Key words:** Technology and finance; Technology enterprise; Financing risk; Neural network

## 1 Introduction

Funds of science and technology enterprise mainly come from financial institutions. However, the current financial market in our country faces too much government control; state-owned financial institutions still dominate the financial market. On this occasion, the correlative operation of technology and finance is difficult to complete spontaneously through the market, so it needs vigorous promotion from the government. Over the years, whether the national science and technology department or the local science and technology committee, they both spend a lot of money to support the development of science and technology enterprises. At the same time, the open economic area and high-tech area also provide financial support for the development of science and technology enterprises in different forms. From the angle of the funds amount, the government's support although could solve the science and technology enterprises' financing problems in some extent, it is still cannot satisfy the enterprises' funds demand. Especially in every stage of the life cycle of technology enterprises, nobody can ensure a steady supply of funds. What's more, government's intervention is a double-edged sword for the development of technology and finance. Although the government's direct and powerful promoting measures achieve the connection between financial and technology in the fastest way, government's intervention may lead the birth defect of the development of technology and finance, and even to bring the huge financial destruction and disaster. In our current technology and finance field, the most important problem which needs to solve is to identify the financing risk factors and take measures to control them from the angle of technology and finance service operation mode.

## 2 Technology and Finance Operation Mode

Zhao Changwen, Chen Chun (2009) hold the view that: technology and finance is a series of systemic and innovative arrangements of financial instruments, financial system, financial policy and financial services to promote science and technology development, achievements conversion and high-tech industrial development. It is a system formed by a variety of subjects—government, business, marketing, social intermediary organizations, which provide financial resources to the scientific and technological innovation activities, together with their behavior in the process of technological innovation financing activities. Based on the above understanding, we think that the technology and finance includes four participants: the first one is the capital demander, such as the science and technology enterprises and the scientific research institutions; the second one is the capital supplier, such as the bank and the risk investment; the third one is the financial intermediary, such as the financial guarantee corporation and credit rating agencies; and the last one is the government acting as the guidance and regulation. The serves of the four major participants will ultimately serve for technological innovation. The operation mode of technology and finance service is shown in figure 1.

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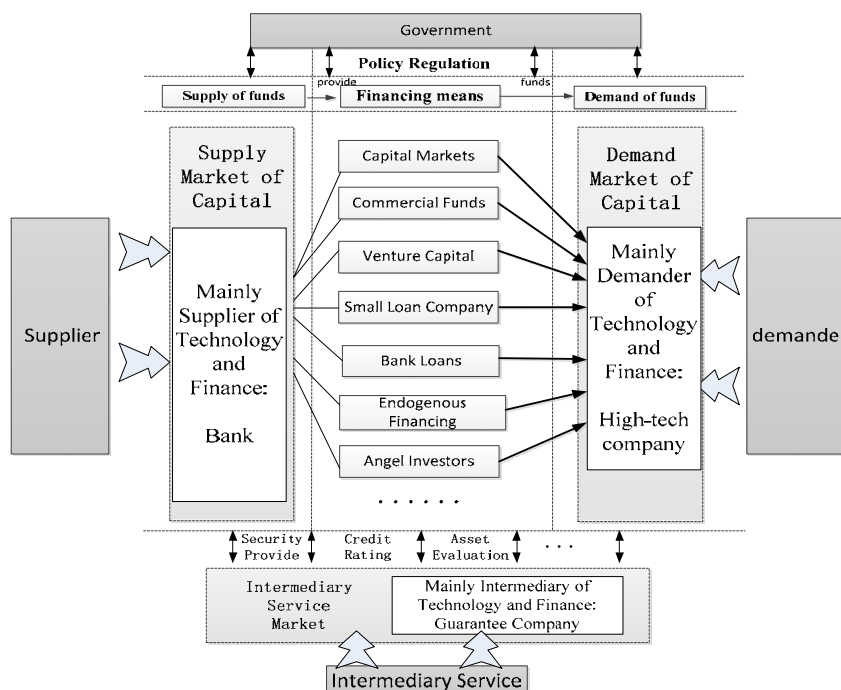


Figure 1 Operation Mode of Technology and Finance Service

Enterprises' funding mainly comes from the banks and other financial institutions. However, there are few banks willing to lend money directly to them, because it is hard to predict its future development and assess its solvency when the science and technology enterprise is in the start-up stage. At this time, enterprises can get loan in the way of mortgage and pledge. If the enterprise has a large number of tangible assets to do mortgages, it will be easier to get loans from banks. However, if the enterprise is still in the initial stage, it will be hard to get loans for its mortgage assets are rarely. So it needs to find a new way of financing. The emergence of intermediary institutions just solved this problem. Banks are willing to provide funds for science and technology enterprise for the guarantee companies providing security and the risk of the loans transfer out. But in perspective of the guarantee company things will be different. On the one hand because the high yield the and risks of the high technology industry are so asymmetric, and because it is defined by high concentration of intangible assets and high concentration of the capital, the information of its development is fuzzy, high technology industrial enterprises, especially small and medium-sized enterprise high technology industry are hard to provide effective guarantee responsibility. The Individual has limited capacity to bear risk. On the other hand when enterprise cannot repay the loan, the security companies will be faced with compensatory risk. From two angles, in process of guarantee the company will face great security risk. In this way, science and technology enterprise cannot easily to search guarantee companies acquiring its security. At this time, as one of the main participants, government will play an important role of regulation. On one hand, for guarantee companies, the government's tax support, guarantee subsidies policy will effectively incentive guarantee company providing security for small and medium science and technology enterprise, which makes the enterprise more easy to get money. For capital supplier, the government organization constructs platform sharing information, combines government departments, financial institutions, technology enterprise, guarantee companies together. Sharing information makes the capital suppliers make right decision more conveniently, and evaluate more accurately to avoid the risk. In addition, the government discount of the loan to science and technology can greatly incentive financial institutions to serve technology enterprise.

### 3 Financing Risk Identification Based on the Technology and Finance Operation Mode

#### 3.1 Financing risk factors of technology and finance

To control financing risk of the technology enterprise, we should identify the financing risk factors firstly. The technology and finance operation mode reflects the four main subjects of the economic

relationship. The existence of this interest relation makes a series of financing risk in the technology and finance operation process. Based on the operating mode of the technology and finance, financing risk factors can be summarized as three aspects. That is, financing risk factors from science and technology enterprise, financing risk factors from the supplier funds and financing risk factors from the government. Due to the intermediary service in investment and financing between demander and supplier, its financing risk mainly comes from upstream and downstream subjects, and the government. So we consider that financing risks from the intermediary service subjects can be summed up in the risks factors from the science and technology business enterprise, the supplier and government.

**3.2 Financing risk indicator of technology and finance**

Combined with the actual situation in our country, based on technology and finance operation mode and the financing risk factors above, and in combination with related research achievements, this paper established the financing risk index library from the three subjects: science and technology enterprise, supplier and the government. Technology and finance financing risk index is shown in table 1.

**Table 1 Technology and Finance Financing Risk Indicator**

Subjects	Fist-level Indicator	Code	Second-level Indicator	Code
Capital Demander -- science and technology enterprises (enterprise)	Market Risk	E1	Market maturity of product	E11
			Market competitiveness of products	E12
	Management Risk	E2	Culture degree of management	E21
			Leadership	E22
	Technical Risk	E3	Technology leading level	E31
	Financial Risk	E4	Debt paying ability	E41
			Asset appreciation ability	E42
	Capital Supplier —bank (Bank)	Information Asymmetry Risk	B1	Information asymmetry
Credit Risks		B2	Reimbursement ability risk	B21
			Moral hazard	B22
Operation Risk		B3	Operation personnel quality	B31
			Violate compasses operation risk	B32
Government -- policy guidance control (Government)	Economic Risk	G1	Economy development cycle	G11
			Macro-economic policy	G12
	Technological Policy Risk	G2	Technology tax policy	G21
			Technology guarantee policy	G22
	Financial Regulation Arrangement	G3	Financial business limit	G31

**4 The Control of Financing Risks Based on BP Neural Networks**

**4.1 The design of neural network model for the financing risk assessment**

4.1.1 The data processing of financing risk indicators

For the qualitative indicators in table 1, their scores can be obtained through the Delphi method. And then use the simple weighted average method to calculate the comprehensive scores of the qualitative indicators. The expert evaluation of financing risks can refer to table 2.

**Table 2 Table of the Identification of Financing Risks**

Code	A	B	C	D	E
Types Of Evaluation	Good State	No Warning	Slight Warning	Medium Warning	Severe Warning
Scores	(0.85,1.00]	(0.7,0.85]	(0.50,0.70]	(0.40,0.50]	(0.00,0.40]

4.1.2 The ensure of the network layer of the neural network model

(1) The selection of the input layer

The input layer of BP neural networks, the indicators of technological financing risks, includes 17 risk indicators in three dimensions, indicated by  $X_i$

(2) The design of the hidden layer

The increase of the hidden layer will improve the training complexity and training time of BP neural networks. There is no theoretical guidance for the determination of the hidden layer nodes, which usually using the experience to select formulas to determine them. In this paper, the empirical formula is  $j = \sqrt{n+m} + a$  ( $m$  is output nodes,  $n$  is the input nodes,  $a$  is a constant between 1-10). The number of the hidden layer nodes is 6.

(3) The design of the output layer

Model of the output layer is the measure of the financing risks of science and technology enterprises, so the number of the output layer nodes is 1. In order to position financing risk, we would divide the technology corporate financing risk in accordance with table 2 in this paper: A stands for well-managed and the output of the model is (0.85, 1.00]. B stands for no warning and the output of the model is (0.7, 0.85]. C stands for slight warning and the output of the model is (0.50, 0.70]. D stands for medium warning and the output of the model is (0.40, 0.50]. E stands for severe warning and the output of the model is (0.00, 0.40].

4.1.3 Model simulation and application

The paper collects information of 12 National Torch Plan Key High-tech business operations information in 2011 in Hubei (derived from *Yearbook of the Hubei Science and Technology 2011*, *Hubei Statistical Yearbook 2011*), and invites experts to estimate the risk of various enterprises and picks them as study samples. What's more, the paper selected the design of the neural network toolbox of MATLAB engineering calculation software, trained and detected the BP neural network early warning model. Training sample data input form of the BP neural network model is shown in table 3.

**Table 3 Training Sample Data Input Form of the BP Neural Network Model**

No.	Sample index	Sample											
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
1	E11	0.55	0.47	0.45	0.41	0.42	0.46	0.44	0.38	0.41	0.61	0.55	0.45
2	E12	0.56	0.48	0.50	0.50	0.48	0.56	0.53	0.55	0.49	0.60	0.56	0.45
3	E21	0.70	0.68	0.69	0.65	0.71	0.66	0.65	0.64	0.75	0.68	0.62	0.63
4	E22	0.90	0.89	0.95	0.96	0.95	0.90	0.90	0.80	0.95	0.96	0.98	0.94
5	E31	0.86	0.84	0.85	0.87	0.82	0.83	0.86	0.85	0.82	0.89	0.90	0.91
6	E41	0.91	0.92	0.95	0.85	0.80	0.86	0.84	0.83	0.89	0.89	0.90	0.91
7	E42	0.76	0.68	0.69	0.72	0.74	0.71	0.64	0.72	0.75	0.68	0.66	0.61
8	B11	0.60	0.59	0.55	0.70	0.56	0.64	0.71	0.56	0.59	0.62	0.65	0.68
9	B21	0.86	0.75	0.68	0.91	0.85	0.84	0.76	0.94	0.85	0.88	0.91	0.72
10	B22	0.64	0.86	0.87	0.94	0.68	0.67	0.85	0.76	0.78	0.84	0.82	0.79
11	B31	0.86	0.84	0.83	0.89	0.92	0.76	0.92	0.97	0.95	0.93	0.82	0.87
12	B32	0.92	0.87	0.86	0.89	0.91	0.90	0.84	0.82	0.87	0.75	0.90	0.81
13	G11	0.88	0.83	0.92	0.79	0.81	0.80	0.86	0.89	0.91	0.87	0.86	0.85
14	G12	0.92	0.94	0.93	0.90	0.92	0.84	0.75	0.79	0.85	0.88	0.82	0.90
15	G21	0.65	0.63	0.72	0.59	0.61	0.73	0.45	0.68	0.73	0.79	0.64	0.66
16	G22	0.56	0.58	0.67	0.73	0.53	0.45	0.57	0.65	0.54	0.53	0.64	0.73
17	G31	0.61	0.49	0.54	0.57	0.67	0.47	0.55	0.53	0.55	0.64	0.72	0.62

Initialize the BP neural network, call newff() function, construct a prior to the BP neural network, and do the following initialization: activation function of hidden layer using tansig function; activation function of output layer logsig function; to ensure the convergence speed of training function, we choose the trained function; Performance function uses the default function, that is the mse functions; The



computation error is 0.01; the maximum learning number is 5000; the former 10 sample is the training sample, the last 2 sample is the inspection sample. As is shown in figure 2, after 3181 times training, network convergence achieves stability, Performance reach the standards, training is finished. The training output of the BP neural network model is shown in table 4. The risk level judgment refer to table 2.

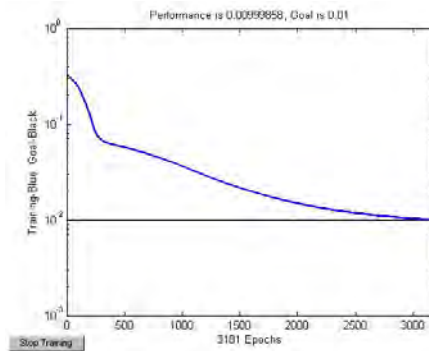


Figure 2 Network Training Error Drop Curve

Table 4 Training Output of the BP Neural Network Model

No.	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Desired Output	0.45	0.68	0.57	0.81	0.75	0.71	0.69	0.78	0.63	0.49
Actual Output	0.66	0.71	0.56	0.74	0.66	0.67	0.70	0.68	0.54	0.64
Risk Level	C	C	D	C	C	C	C	C	D	C

The paper standardized the index of 11, 12 samples and summaries expert practical assessment result of them, respectively as the input data and desired output data of model test. Testing results is shown in table 5.

Table 5 Network Output and The Expected Output

No.	C11	C12
Desired Output	0.63	0.58
actual output	0.7444	0.4969
Expected risk level	C	D
Actual risk level	C	D

The testing results indicate that the financing risk assessment results of the two enterprises are grade C risk and grade D risk, which are the same as the expected risk assessment. Therefore, the example shows that technology enterprise financing risk control model based on the BP neural network is effective. The model after trained and tested can be used into the actual operation, and help the enterprise to take corresponding financing risk control measures.

**4.2 Financing risk control measures of technology and finance**

4.2.1 Financing risk control measures of technology enterprises

Enterprises can control its risks mainly from the following aspects. Firstly, enhance the sense of competition, improve its own innovation ability and accelerate the technological transformation and upgrading speed of products. Secondly, establish a good credit concept to obtain the trust and support of the capital market, clear the various financing channels and reduce financing risks. Thirdly, strengthen analysis and judgment ability of the economic form and the national macroeconomic and financial policies. According to the changes of macroeconomic policies, make sufficient use of the advantage of technology enterprise that it's small enough to adjust its business strategy, financing strategy, financing mode and financing scale timely.

4.2.2 Financing risk control measures of capital suppliers

Chinese capital suppliers mainly referring to commercial banks should try hard from the following respects to prevent and control of technological enterprise's financing risk. At first, improve the credit

management mode of commercial banks in order to adapt to the technological enterprise financing demand better. Secondly, commercial banks should establish specialized credit department for technological enterprise to provide its financing support. At last, extend the corresponding intermediate business of commercial banks. During the process of reform, commercial banks should actively expand the intermediate business such as trust, commission, insurance agents, guarantee, consulting and custody.

#### 4.2.3 Government's control measures for technology and finance financing risk

Collaboration of technology and finance is inseparable from government's guidance and regulation. In order to control the technological enterprise's financing risks. Government should make effort in the following aspects.

1) Improve tax preference policy. Seen from the technology and finance operation mode, the financial objects are not only technological enterprises, such as the sell and transfer part of the implementation which could have tax incentives in the process of the product sales, but also the guarantee agencies and the supply side. Guarantee agency exists between capital supply and demand sides of the middle, which have danger in upstream and downstream. It's a great inspire that the bonding companies to provide scientific and financial services as the technology guarantees policy, in favour of technology enterprises to raise funds.

2) Build the platform of technology and finance information. In order to put government departments, financial institutions, high-tech enterprise, security companies together, enable information sharing, the government should build science and technology enterprise information platform. On the platform, record individual's credit of enterprises, technicians and entrepreneurs, carry out scientific and technological assessments of credit rating.

3) Formulate supportive policy of science and technology guarantee. Government should establish institution of financial participation, set up guarantee risk compensation fund by the finance, guarantee agencies, banks and many other institutions, and compensate for the risk from the large-scale technology projects guarantee.

## 5 Conclusions

Through the study, there are two major conclusions: one is that because of the economic benefit relations will form the corresponding financing risk, technology and finance capital supplier, demander and intermediary institutions in the operation process of technology and finance will face the possibility of technology and finance market imbalances. As one of the main technology and finance participants, government should play the regulatory role; the other is that using BP neural network to construct financing risk evaluation model of technology and finance has the feasibility and practicability. The financing risk indicators contain qualitative and quantitative indicators, BP neural network can organic combine them. The analysis results can help enterprise to locate financing risk accurately.

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# Research on Disclosure of Other Comprehensive Income for A-Shares Market

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**Abstract:** In order to fulfill the internationalization of the accounting standard and provide the enterprises' real income to the users of accounting information, Ministry of Finance promulgated the No. 3 Explanation of Accounting Standards for Enterprises. It meant that other comprehensive income (OCI) was introduced and applied officially. Based on the overseas and domestic research status and the method of descriptive statistics, this paper analyzes the other comprehensive income disclosure of A-share listed companies and reveals the main problems in other comprehensive income disclosure. Finally this paper offers some proposals about the other comprehensive income disclosure system's rebuilding of A-shares listed companies for purpose of enhancing the information quality of listed companies' other comprehensive income disclosure.

**Key words:** A-shares market; Other comprehensive income; Information disclosure; Method of descriptive statistics

## 1 Introduction

Comprehensive income<sup>[2]</sup> first appeared on SFAC No.3. According to the definition of SFAC, comprehensive income is the change in equity of a business enterprise during a period from transactions and other events and circumstances from non-owner sources. It includes all changes in equity during a period except those resulting from investments by owners and distributions to owners.

Interiorly, comprehensive income has its evolution course. On February 15th, 2006, Ministry of finance issued new Accounting Standards for Business Enterprise which realized the convergence with IFRS. Firstly, the new standards were carried out by listed companies. Then, they were spread to state-owned enterprises and financial enterprises gradually. Later, IFRS has been carried out a series of revision. In order to keep the same space with IFRS and solve the problem in the implementation process of new standards, Ministry of finance issued a series of supplementary regulations.

The system of new standards brings the concept of Balance sheet, but it doesn't require disclose the comprehensive income in the report form and foot-notes to the financial statements like IFRS. Concept of OCI firstly appeared in the No. 3 Explanation of Accounting Standards for Enterprises, corporations were required add the items of OCI and comprehensive income in the profit statement. In order to make OCI more easily to understand, Ministry of finance issued the document about listed companies and unlisted companies implementing financial accounting standards to prepare annual report of 2009 well. Meanwhile, the format of statement of owners' equity was adjusted and detail regulation about disclosure of OCI in the foot-notes to financial statements was established. With this, comprehensive income has been applied formally.

Based on this situation, the domestic scholars began to pay attention to the prevailing research field which was about disclosure of comprehensive income. Before 2009, most domestic scholars, for instance Ge Jiashu, only touched upon introducing and researching the report which were about how to improve the enterprise performance, which was similar to the situation of foreign theoretical circles. However, after the No. 3 Explanation of Accounting Standards for Enterprises made relevant stipulations on disclosure of OCI, the research fields began involving relevant the disclosure of financial statement. Although they still mainly focused on its specifications and criteria, much research on the current situation of OCI has been done on the basis of the market statistics. But proposals about the OCI disclosure are not given from the whole perspective. This paper covers this shortage and aim to improve the information quality of OCI disclosure.

## 2 Analysis of A-Share Listed Companies in OCI Disclosure

### 2.1 Current situation of OCI disclosure

Overall, the 2009 information disclosure was not ideal, only a few companies disclosed information of OCI in the profit statement. Because it was the first year of OCI disclosure which has been required by Ministry of Finance and CSRC. According to the annual financial report data from

Guo Tai An database, Statistics found that only 15.12% of the A-share listed company disclosed the information of OCI in 2009. But the situation have been greatly improved in 2010, the proportion increased to 43.31%. Looking up the annual reports of listed companies, the fact could be found the vast majority of the companies which have disclosed the OCI have restated this information which was in the previous year. Compared with the situation of 2010, there has been further improved in 2011. The companies which have disclosed the OCI accounted for 91.71% among the 2341 A-share listed companies. It can be seen, as time goes by and with the enhancing of companies' attention, the disclosure of OCI have been improved.

Among the companies which have disclosed OCI in 2009, there were 74 companies which have disclosed OCI of negative, accounting for 28.9% of the total number of disclosure. On the contrary, there were 191 companies which have disclosed OCI of positive, accounting for 72.1% of the total number of disclosure. But this situation has changed dramatically in 2010. The number has become 562 which have disclosed OCI of negative, accounting for 61.42% of the total number of disclosure in this year which has risen comparing to last year. And the number has become 353 which have disclosed OCI of positive, accounting for 38.58% of the total number of disclosure which has fallen. There were two reasons for this change. The depression of China's stock market led to the fair value of available-for-sale financial assets which were held by the listed companies reduced, this resulted in the dropping of OCI. On the other hand, the dollar's devaluation led to losses which were produced by currency translation differences, it could result in OCI of negative and offsetting effect to comprehensive income. Among the companies which have disclosed OCI in 2011, the number was 781 which have disclosed OCI of negative, accounting for 76.72% of the total number of disclosure, and there were 237 companies which have disclosed OCI of positive, accounting for 23.28% of the total number of disclosure. This situation was better than the previous two years.

Below three tables are the descriptive statistic about net profit, OCI and comprehensive income regard to the companies which disclosed their OCI from 2009 to 2011, the data bases on A-share market annual reports which were provided by Guo Tai An database. (Unit: yuan)

**Table 1 Descriptive Statistics of the 2009 Earnings**

Items	Net profit	OCI	Comprehensive income
Mean	587421956	103601926	690749878
Median	66444683	1674987	96666368
Minimum	6737130612	319000000	6494186182
Maximum	1456000000	765700000	2213900000

**Table 2 Descriptive Statistics of the 2010 Earnings**

Items	Net profit	OCI	Comprehensive income
Mean	1692366805	-73053905	1619320029
Median	147974622	-278914	142729428
Minimum	-2740394151	-1621600000	-2903628046
Maximum	16602500000	279600000	16195300000

From table 1 and table 2, we can see that the mean of OCI is 103601926, median is 1674987, both of them are positive value, they have a positive effect to the item that increases the amount of the comprehensive income; In 2010, the mean of OCI equals to -73053905, median is -278914, both of them are negative value, they have a negative effect to the item that decreases the amount of the comprehensive income. As stated above, the reason of this phenomenon appearing is that the macro-economic environment has changed. This change lead to the loss of translation reserves, which was caused by recession in the stock market and devaluation of foreign currency assets in the whole 2010. All of these gains and loss cannot be disclosed in the traditional profit statement. These gains and losses cannot be realized in the report period, but they have a profound effect on the future accounting surplus and liquidity of assets.

**Table 3 Descriptive Statistics of the 2011 Earnings**

Items	Net profit	OCI	Comprehensive income
Mean	1767285785	-116410511	1652415599

Median	0	-1214860	130738944
Minimum	-8838826405	-24214000000	-10883552399
Maximum	208445000000	3142000000	200494000000

Base on the statistics in table 3, the mean of OCI is -116410511, the median is -1214860, both of them are negative value. So they produced the negative effect on comprehensive income amount, which were more than 2010. The reason of this phenomenon is the continually uncertainty in macro-economy. On the one hand, domestic stock market experienced a big adjustment this year, the amount of market financing and stock trading volume declined a lot, market sentiment depressed and needed to be recovered. On the other hand, although the financial crisis has passed for 3 years, the economy in Europe and US are still in the shadow of the recession. it's coupled with the gradual deepening of the European sovereign debt crisis, loose monetary policy in countries and the rapidly rising commodity prices which exacerbating inflation in emerging market countries. All of these produced significant impact on accounting earnings and liquidity of assets for the future business.

After three years' practicing, although enterprises performance was not so satisfactory, but it's undeniable that the No. 3 Explanation of Accounting Standards for Enterprises is more comprehensive in the evaluation of the enterprises' OCI disclosure and more helpful for the information users making reasonable decision.

## 2.2 Existing problems of OCI disclosure

### (1) Articulation error of income statement and owner's equity statement

Articulation<sup>[1]</sup> is the logical relation which can verify each other. In the financial report with the same company and the same period, this logical relation must exist between income statement and owner's equity statement. During disclosing the OCI, articulation error appeared in the financial statements of some firms. The error was embodied in the inconsistent amount of OCI items between the profit statement and owner's equity statement.

### (2) Unauthentic presentation of OCI

It mainly reflects that increasing and decreasing the number of OCI<sup>[3]</sup>. The situations of increasing the number are as following: putting the capital transaction into OCI, putting part of the modification of retained earnings into this item, mistakenly adding the change of equity which comes from the capital transaction of subsidiary into this item, ignoring to put the income tax into the item which is ought to be done. The opposite means that some items which should be added into the comprehensive income subject are left out, it will make the amount of comprehensive income incorrect. There are many factors can lead to such a situation. For example, forgetting to put the translation reserve into comprehensive income, not rolling out the comprehensive income when the firms handle the situation like losing the control right of subsidiaries, etc.

### (3) Lacking of sufficiency and relativity on financial statement presentation

Bringing in the item of comprehensive income makes the financial statements reflect the firms' performance well. But, as a new thing, the implementing time is too short to understand it overall by the employees of the firms, which lead to lack of sufficiency and relativity in the process of preparing the financial statements and disclosing relative information. The outstanding performance shows that some companies present the comprehensive income in the financial statement, however, they only present the remaining balance of some certain accounting period, amount changing cannot be seen in the item, which makes users of financial statements not have a good understanding about the item of OCI, this is contradictory to the original intension about bringing the OCI into the profit statement. What's more, it will lead to opposite effect which will annoy the users of financial statements to understand the real income of the firms and affect their decision.

## 3 Rebuilding of A-shares Market OCI Disclosure System

### 3.1 Accounting standards layer

#### (1) Making the definition and difference between OCI and capital transaction more explicit

Because the new accounting standard system has neither the explicit definition of capital transaction nor the explicit principal of it, this lead to lots of companies regarding capital transaction as OCI and listing it in profit statement. Suggestion here is making utility and instruction of capital transaction more explicit, so that the definition and difference between capital transaction and OCI can be distinguished clearly.

#### (2) Setting the confirmation of OCI item more explicit

Lots of matters which are directly recorded in the owner's equities exist in the accounting standard system. The proposal here is defining the transactions and matters of it, specifying the essence of those matters, and then specifying the principle of confirmation. At the same time, making the regulation of special OCI items is also important, such as shadow accounting invent by insurance companies.

### (3) Adjusting the accounting subject

Accounting subject of OCI should be set separately. Transactions and matters which belong to OCI can be count into OCI accounting subjects. OCI secondary accounting also can be set under capital reserve item to isolate the capital reserve from OCI and the capital reserve from capital transaction. This can avoid the confusion between the two definitions and make statistical data and report filling more convenient.

### 3.2 Layer of operational practice

A part of reasons of unauthentic figures appeared in OCI report is leadership's dressing, but the most important reason is the finance staffs' inaccurate understanding about the accounting standards. And a lot of OCI report problems still appeared in 2009~2010 listed companies' financial statement after the auditing by China CPA (Certified Public Accountant), it indicates that there are still some auditors haven't enough understanding of comprehensive income and OCI.

Encouraging the related persons to understand of OCI overall is the key to solve these problems. Let them eliminate the misjudgments of OCI, clarify the difference between OCI and capital reserve, and then disclosure the correct OCI items in the routine affairs processing and financial statement forming, so that the enterprises' OCI can be reflected authentically. The release of 2010 and 2011 annual reports reflected that the authors of financial statements and related auditors has more explicit understanding of OCI items, lots of confusions have been clarified, and OCI disclosure was becoming more standard and abundant than 2009.

### 3.3 Layer of supervision

The purpose of introducing the OCI is providing the real performance of corporate<sup>[4]</sup> to report users, and letting them make reasonable decision. But there still has opportunities to let leadership dress the reports because there are loopholes existed in the OCI disclosure, it leads to the results that the purpose and request required by the No. 3 Explanation of Accounting Standards for Enterprises cannot be reached, so the supervision becomes the most important things. Although some related supervision organizations have already paid attention to OCI report and disclosure, but they didn't do enough.

In order to let listed companies provide reliable income information, related supervision organization could establish a supervision mechanism regard to OCI report and disclosure. The list of those companies should be published which didn't disclosure their OCI items according to the disclosure principle to let leadership pay enough attention on it. At the same time, the problems should be summarized and analyzed every year and the feasible proposals for these problems also should be raised.

## 4 Conclusions

Though summarizing and analyzing the disclosure of A-share listed companies' OCI from 2009 to 2011, the major problems of OCI's presentation and disclosure could be exposed. In order to solve these problems, suggestion to refactor A-shares market OCI disclosure system should be put forward.

(1) At accounting standards layer, standards setting organizations should optimize the provision to guide the disclosure of OCI. Particularly, they should make a clear definition for OCI and capital transaction, have a distinction between them and make the OCI item more explicit. In addition, the accounting subject should be adapted to the OCI's recording.

(2) At the layer of operational practice, training for relevant employees should be strengthened in order to let them understand and handle the OCI item more comprehensive.

(3) In the supervision level, the supervisory mechanism about OCI's report and disclosure are needed urgently because the time of introducing the OCI items is too short, so it can guide and supervise the listed companies to the disclosure of OCI.

The research of this article aim to enhance the information quality of the OCI disclosure, but whether this disclosure can provide much more information to users of the financial statement, it needs much more in-depth research.

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# Measuring Market Liquidity at Shanghai Stock Exchange Based on the Generalized Dynamic Factor Model

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**Abstract:** Market Liquidity is crucial and unobservable in finance field. We defined the commonness in liquidity across securities, and then apply the Generalized Dynamic Factor Model with block structure to extract market liquidity from three observed liquidity measures: daily excess volatility, daily turnover and daily resilience. Using GDFM without any restrictive assumptions on the data generating process, the extracted market liquidity consider time dependence and commonness. The empirical results show that the three liquidity measures appear to be driven by one-dimensional common shocks, and the composite liquidity calculated based on the commonality as market liquidity is highly related to other market liquidity measures, which therefore qualify as market liquidity shocks.

**Key words:** Market liquidity; Liquidity measures; Shanghai stock market; Generalized dynamic factor model; Block structure

## 1 Introduction

Market liquidity is the embodiment of market operation quality. Rise of empirical finance pushed forward the highlight of the critical role of market liquidity in asset pricing and market efficiency. Current researches on liquidity domestic focus on market liquidity, the factors of liquidity, liquidity premium and liquidity risk measures. In empirical analysis, how to measure the stock market liquidity becomes a key and fundamental issue naturally.

Researches on the whole market liquidity focus on not only the commonality in liquidity and its varying characteristics, but also the relation between the commonness and idiosyncrasy. Therefore, comparative analysis of liquidity can be developed in different stock markets indifferent regions or different types of stock markets. Stock liquidity measures reflect the liquidity from different dimensions separately, and the dimensions conflict mutually. Chordia et al. (2000) found that there is a common component among various liquidity measures, and Amihud(2002) held that market liquidity results in price differences across assets. Brockman and Chung(2002) found that the commonness in individual stock at least partly is determined by market factor, and there is co-movement between the variation of stock liquidity and market or industry liquidity. The co-movement is also found in China, see Song and Tan(2005) and Yu and Gong (2008). Chordia et al.(2001) regarded market liquidity as the weighted average of all stocks liquidity. Given the papers mentioned above, we define the common factor among different liquidity measures as market liquidity.

The generalized dynamic factor model integrates the dynamics of common factors in the exact factor model and the non-orthogonal idiosyncratic terms in static approximate factor model. The GDFM in the presence of block structure applied in the analysis of market liquidity can handle several liquidity measures, jointly or separately. For  $K=2$  blocks, the GDFM decomposes the Hilbert space spanned by all liquidity measures into four mutually orthogonal Hilbert subspaces. And then, projecting individual liquidity measure onto the four subspaces yields strongly common, strongly idiosyncratic, weakly common and weakly idiosyncratic components, respectively. See Hallin and Liška(2008) for details.

## 2 Data

We considered the normal-listed A-share stocks in Shanghai market, that listed before Wednesday January 4th, 2006, and that were still listed normally in the following years. The data was gathered from RESSET finance database, for each stock, including the basic information and transaction data. In order to reduce the abnormal effects, we excluded the stocks with long-time suspension, or without share reform, or with delisting risk or special treatment during the period under study. Then, this leaves us a sample for study with  $n=376$  stocks  $T=1459$  observation dates, and missing values of the sample stocks were interpolated.

Because of the limitation of data acquirement, we selected three observable liquidity measures. The first one is excess volatility adopted from the SEC report, defined as the difference between intraday and interday price range. The second measure is turnover rate multiply 100. The last one is the daily



resilience. The three measures, denoted by  $EXV_n$ ,  $TR_n$  and  $RESIL_n$  respectively, are in ratio form for the purpose of dimensional consistency, and each of them covers a different dimension of liquidity, proxy for tightness, depth and resilience respectively.

**Table 1 Descriptive Statistics of EXV**

EXV	m	IQR	m-v	IQR-v
All	0.0474	0.0059	0.0016	3.50E-04
$[0, Q^{0.25})$	0.0415	0.0036	0.0013	2.06E-04
$[Q^{0.25}, Q^{0.5})$	0.0464	0.0015	0.0016	8.56E-05
$[Q^{0.5}, Q^{0.75})$	0.0491	0.0014	0.0017	7.91E-05
$[Q^{0.75}, +\infty)$	0.0526	0.0019	0.0019	1.20E-04

**Table 2 Descriptive Statistics of TR**

TR	m	IQR	m-v	IQR-v
All	2.9806	1.2470	7.6206	5.9672
$[0, Q^{0.25})$	1.7921	0.6272	2.7578	1.5239
$[Q^{0.25}, Q^{0.5})$	2.6865	0.2921	5.5999	1.5442
$[Q^{0.5}, Q^{0.75})$	3.2546	0.2634	8.3508	1.6940
$[Q^{0.75}, +\infty)$	4.1893	0.6204	13.7741	3.7543

Table 1,2 and 3 shows the descriptive statistics of the means and variances of the three liquidity measures per stock over the sample period, including the cross-sectional means(denoted m and m-v) and interquartile ranges(denoted IQR and IQR-v). It is evident from the table that the larger the mean of the liquidity measure is, the larger the variance is, and that the interquartile range is larger on the tails of the distributions of the liquidity measures. Phillips-Perron unit root tests showed that, at 1% confidence level, all the liquidity measure series are second order stationary. In addition, liquidity time series are strongly autocorrelated and persistent, especially for the averaged turnover rate and daily resilience. Scatter plot of the three liquidity measures showed a cloud with a fuzzy gather and presents undefined principal directions, which means that we should be modeled via GDFM method.

**Table 3 Descriptive Statistics of RESIL**

RESIL	m	IQR	m-v	IQR-v
All	0.0382	0.0045	5.08E-04	1.01E-04
$[0, Q^{0.25})$	0.0334	0.0031	4.08E-04	5.20E-05
$[Q^{0.25}, Q^{0.5})$	0.0375	0.0013	4.83E-04	1.65E-05
$[Q^{0.5}, Q^{0.75})$	0.0396	0.0011	5.33E-04	2.75E-05
$[Q^{0.75}, +\infty)$	0.0423	0.0015	6.09E-04	5.88E-05

### 3 Results

Using the Hallin and Liška (2007) information criterion, we identify the numbers of dynamic factors. That is, the dynamic dimensions of the common spaces of the seven (sub)panels  $EXV_n$ ,  $TR_n$ ,  $RESIL_n$ ,  $EXV_n - TR_n$ ,  $TR_n - RESIL_n$ ,  $EXV_n - RESIL_n$  and  $LIQ_n$ . Identification is based on a visual inspection of figure 1.

The first plot in figure 1 shows that  $q_{EXV}^* = 3$  (for  $c \in [0.153, 0.159]$ ), and likewise  $q_{TR}^* = 6$  (for  $c \in [0.156, 0.162]$ ),  $q_{RESIL}^* = 2$  (for  $c \in [0.149, 0.159]$ ),  $q_{EXV-TR}^* = 6$  (for  $c \in [0.134, 0.135]$ ),  $q_{EXV-RESIL}^* = 2$  (for  $c \in [0.118, 0.120]$ ),  $q_{TR-RESIL}^* = 6$  (for  $c \in [0.127, 0.134]$ ),  $q_{EXV-TR-RESIL}^* = 6$  (for  $c \in [0.121, 0.123]$ ). All plots 3 leads to a selection of one single common factor. This means the three liquidity measures share the same common space, and the shocks driving commonness in relative spread and commonness in volume are the same. In the other hand, this may indicate that market liquidity effects are originated from the market itself, then the one-dimensional factor strongly qualifies as the unobservable market liquidity shock.

Figure 2 presents the decomposition, the percentage of total variation explained for each liquidity measure. Apparently, market liquidity accounts for 23.88% of total variations of excess volatility, for

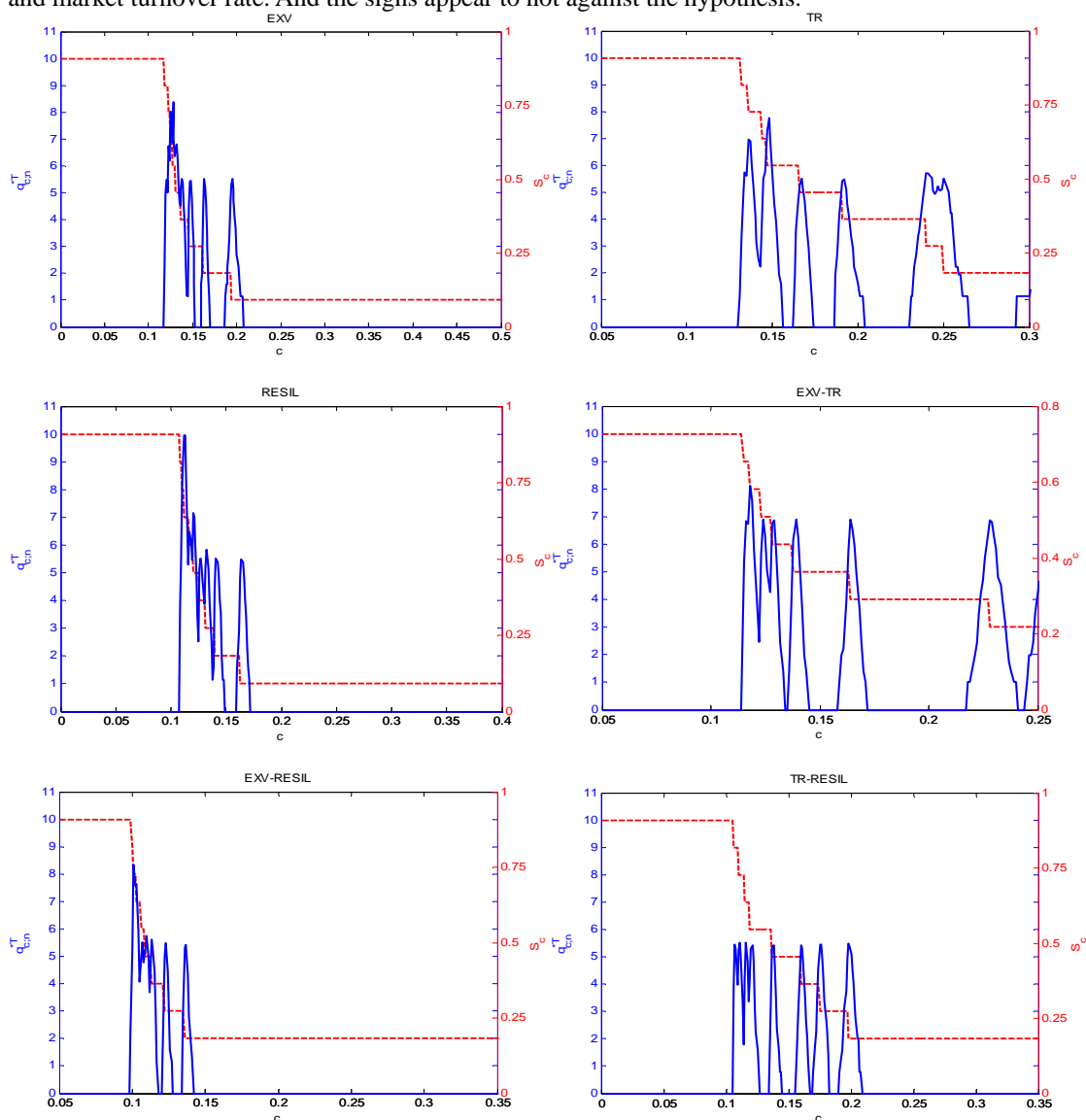
13.96% of total variations of turnover rate and 14.90% of total variations of daily resilience. These proportions are larger than the conclusion abroad. Partly because the model itself allows for cross-correlation among the idiosyncratic components, and partly because in the paper, we took Chinese stock market for study, and the market is not mature compared with developed markets abroad.

**Table 4 Correlations Between the Composite Market Liquidity and Other Measures**

Correlation	Pearson	Kendall's tau_b	Spearman
ILLIQ VS MTR	0.115***	0.134***	0.206***
ILLIQ VS CLIQ	-0.418***	-0.265***	-0.389***
MTR VS CLIQ	0.387***	0.410***	0.576***

\*\*\*. Correlation is significant at the 1% confidence level (2-tailed).

As in Ref.[1], the extracted commonness can be equal-weighted averaged as the composite market liquidity(denoted CLIQ) and then qualifies as market liquidity measure. Furthermore, we computed the correlations between the other measures former scholars proposed. In table 2, ILLIQ denoted the market wide illiquidity, while MTR denoted the market turnover rate. The results shows there are strong relations between the composite market liquidity measure and other measures such as market illiquidity and market turnover rate. And the signs appear to not against the hypothesis.



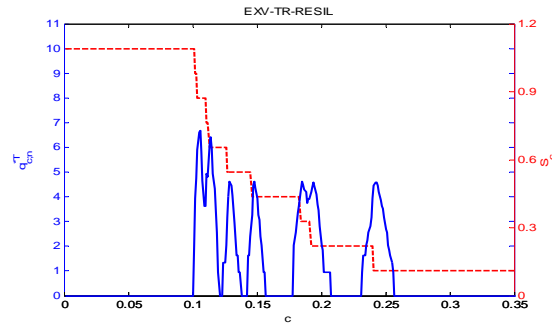


Figure 1 Identification of Dynamic Factors

#### 4 Conclusion

The GDFM disentangles the assumption of the relation between commonness and idiosyncrasy, and can handle co-movement and time dependencies at the same time to draw a clear distinction between common and idiosyncratic components, and estimate the dimension of the common space to identify the commonness over different liquidity measures. In the paper, we extracted one-dimensional common factor, which strongly qualify as the market liquidity shocks. And for the composite liquidity measure, the correlation test shows the composite liquidity is feasible and significant.

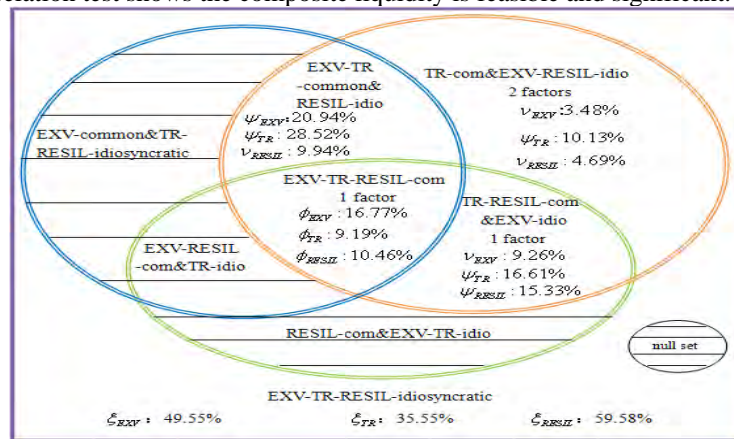


Figure 2 Decomposition

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## Micro & Macro Evidence on Innovation and Economic Performance of Algerian Firms

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**Abstract:** Innovation is often associated with competitiveness, economic performance and economic growth; it is accepted that Innovation is one of the efficient means to obtain a superior and a stable position in the marketplace. In the last few decades; the literature has shown that the growth in the stock of knowledge has been the most important factor behind the dramatic rise in living standards in countries that show a broad convergence in macroeconomic performance. Countries, also, all around the globe are paying a great attention to Innovation as well as to the whole national innovation system (NIS); While some other countries are still in need to gather their efforts in ways that drive the innovation activities development.

This paper aims at identifying the main characteristics of the NIS of Algeria, it, also, highlights the key innovation problems and obstacles of industrial firms, mainly in North African Countries. Our work is based on the one hand on a theoretical, and comparison study, of the National innovation system, of the Maghreb countries. On the other hand it stands on a field research carried out on a sample of Algerian industrial firms, the interpretation and analysis of the results of our survey through using both, descriptive analysis and logistic regression helped identifying the core characteristic of the Algerian innovative enterprises, in addition to the main obstacles of innovation in Algeria; in Maghreb countries, innovation systems construction takes place in a very specific environment characterized by privatization of public concerns, the rise of a strong Small & Medium enterprises sector but with very little experience in the fields of R&D and innovation, and a relatively weak industrial sector in terms of industrial performances, suffering high obsolescence both in terms of human resources, equipment and linkages between the different actors of the innovation system, which negatively affects the role played by research on development processes. Some recommendations, for a well-functioning national innovation system for Maghreb countries, have been drawn from this study.

**Key words:** Innovation; National Innovation System; R&D; Logistic Regression; Algerian firms; product & process innovation.

### 1 Introduction

Let's try for a moment to think of a world without airplanes, automobiles, telecommunications, televisions, refrigerators, telephones, internet, agriculture ...where would we be without essential stuff for our lives such as alphabet, languages, printing etc? Maybe you would not be able to read this paper, and I, of course, would not be able even to write a word in it. Without Innovation our world would look very, very different, hence Innovation is as old as mankind itself, there seems to be something naturally human to thing about new and better ways of doing things and try them out in practice. In spite of its clear significance, innovation has not always got the scholarly attention it deserves, except in the last few decades; nevertheless, some authors have been interested in innovation processes, from the viewpoints of economic growth, changes and progress (Schumpeter 1939; Schmookler 1966; Freeman 1990; Kline & Rosenberg 1986; Dosi 1982; Amendola & Gaffard 1988, etc.), of social and organizational changes (Rothwell, 1994; Chandler 1990; Callon, 1994, etc.), or from the sociological and managerial viewpoint (Crozier & Friedberg 1977; Mintzberg 1982; Akrich, Callon & Latour 1988; Alter 2000, etc.).

Most authors, economists and theoreticians in the field of innovation have generally accepted that innovation is a key condition for economic success (Hamel, Gary & Gary Getz 2004; Audretsch et al 2000). It has also been argued that the most remarkable examples of growth have been based on 'upsetting innovation's platform. (Christensen et al. 2002). While much has been written on the role of innovation on economic growth, including the influential work of Schumpeter from the 1930's, only lately has there been a compelling folder made to argue that external environmental factors are at least as important as internal factors in motivating innovation. In particular some location based advantages such as the privileged access to information and institutions, the local economic, social, technological

and political factors, and moreover the ability of acceptance in the local market by consumers (Porter, et al. 2001), mainly because there seems to be found a kind of strong effect of consumer desires and needs on the innovativeness of Industries; Schumpeter (1942) declared that Changes, including unexpected results and ongoing processes of creative destruction, create a need for systematic innovation of products, processes and management practices. He also defines Innovation as the process and outcome of creating something new, which is also of value. Michel Porter identifies it as “new way of doing things, which is commercialized. The process of innovation cannot be separated from a firm’s strategic and competitive context...” one of the more cogent definitions of innovation is to be found in Theodore Levitt’s work. According to Levitt, “To be innovative, an idea must be creative and it must be implemented” (Levitt, 2002). Nevertheless; particular emphasis was placed on Hamel’s ‘Design Rules for Innovation’ and Drucker’s comments on industry and market changes, demographic changes, and changes in perception (Hamel, 2000; Sutton, 2001; Drucker, 2002). This emphasis was balanced with consideration for the external environment, including factors such as preferential access to information and information flows (Porter & Stern, 2001). Rogers simply identifies innovation in general as “any idea perceived as new by a person or system” (Rogers, E.M. 1992). Bingham also accepts the definition of innovation as “the first or early use of an idea by one of a set of organizations with similar goals” (Bingham, R.D. 1976). Altshuler and Zegans stress (1990) action by defining innovation as “novelty in action”.

Meanwhile Change is the key point in Moore, Sparrow and Spelman’s definition of innovation, “any reasonably significant change in the way an organization operates, is administered or defines its basic mission,” (Moore, M. H. et al. 1997 ). In Lynn’s definition of innovation “innovation is an original, disruptive and fundamental transformation of an organization’s core tasks”. (Lynn, L. E., Jr. 1997.). Van de Ven et al (1999) suggested that the best strategy which can be taken is to avoid being stuck in the middle, and remain to different solutions/ideas; From this point of view the stress is moved from the introduction of specific new and useful ideas to the general organizational procedures and processes for generating, considering, and acting on such insights leading to important organizational improvements or novelty of products, services, or processes. Through these diversities of perspectives, creativity is in general seen as the source for innovation, and innovation as the successful implementation of original and creative ideas within an organization. Table 1 which follows provides a comparison between four main concepts linked together in so many areas, which are innovation, creativity, invention and science.

**Table 1 – Innovation, creativity, invention and science**

<b>INNOVATION vs INVENTION</b>
<b>Invention</b> is the creation of a new concept.
<b>Innovation</b> is reducing that concept to practice, and making it a commercial success.
<b>INNOVATION vs CREATIVITY</b>
<b>Creativity</b> is coming up with ideas.
<b>Innovation</b> is bringing ideas to life.
<b>INNOVATION vs SCIENCE</b>
<b>Science</b> is the conversion of money into knowledge.
<b>Innovation</b> is the conversion of knowledge into money.
<b>Source: Composed according to Feldman, M., 2004</b>

Arguably, we understand the role played by innovation in economic change, mainly because innovation introduces novelty (variety) into the economic field, for the reason that without innovation the economy will settle down in a “stationary state” with little or no growth (Metcalf 1998), therefore, innovation is essential for long-run economic growth. Furthermore; innovation tends to gather in certain fast-growing sectors, leading to structural changes in so many areas such as production, demand technologies and, ultimately, organizational and institutional changes. The capacity to be the leader in any market or business issue is central for the ability to take advantage from innovation. Innovation also is a powerful explanatory dynamic behind dissimilarities in performance between organizations, regions and countries. Industries that succeed in innovation growth, at the expense of their less able competitors, Innovative countries and regions have higher productivity and income than the less-innovative ones.

Without a doubt, innovation is one of the essential factors of business performance as well as economic growth, the interactions between innovation and success have been and are still being a central topic of a number of studies; Schumpeterian and Neo-Schumpeterian analyses and endogenous growth theories are ones of the most interesting works in this field. Schumpeter for instance builds

almost all of his studies and literature upon technological innovation, which is mainly based on Research and development (R&D); he highlighted the relationship between economic growth and innovation. Schumpeterian and neo-Schumpeterian analyses emphasized also the role played by the public policies to support innovation; mainly through sustain strategies within the country, as exemplified by Schumpeter's "psychological" theory of entrepreneurial behavior (Fagerberg; 2003). Likewise, most work on knowledge focuses on individuals, not organizations. Except Nelson and Winter's work (1982), on "organizational memory" and its links to practice lined the way for much subsequent work in this topic. However, In the late of the 1980s, a new conceptual framework appeared in the economic literature, which is called The National Innovation System, by researchers like Freeman, Lundvall and Nelson, this framework suggests that the research system's main goal is Innovation, and that the system is a component of a larger system composed of government, universities, research labs, and industries and their environment (Godin B. 2007); since then, and because of human resources development, the flow of foreign direct investment (FDI) and the rapid economic growth in some countries such as the US, the EU member countries, Japan, China, developments in the field of science, technology and innovation helped to make those countries and regions in the spotlight of the economic analysis for numerous researches. NIS is getting a growing importance in the literature as well as in policy making for countries all around the world, mainly for understanding and promoting innovation and economic development. (Stephen Feinson, 2002).

## **2 A Brief Overview on the National Innovation System (NIS) Approach**

After its introduction in the late 1980s by researchers such as Freeman (1987, 1988), Lundvall (1988) and Nelson (1988), the concept of National Innovation system has been further elaborated and underpinned in the early 1990s. It can be regarded as a well-known approach within modern innovation research. Above all, the approach focuses on the analysis of national structures of innovative activities, their institutional determinants and economic effects. Freeman defined NIS as the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies. (Freeman, 1987); Lundvall (1992) declared that NIS is the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state. Nelson, also, (1993) affirmed that it is "a set of institutions whose interactions determine the innovative performance ... of national firms; however, The NIS approach stresses that the key to the innovative process are the flows of information and technology between institutions, enterprises and people. Innovation and technology (I&T) improvements are the result of a multipart set of interactions among NIS actors, which contains people, enterprises, universities and research institutes (OECD, 1997). According to the OECD (1997) Innovative performance and general competitiveness can be achieved if the actors of the NIS understand what the best tools, and what the significant roles of the NIS are, and by the way the well understanding of NIS can help identifying leverage faces for enhancing economic performance. Several advanced economies have relied on Policies, which seek to improve networking among the actors and institutions within the system and to enhance the innovative ability of firms and people. And thus several developed economies are supporting education, research, and business in order to foster national and regional competitiveness.

From a neo-Schumpeterian viewpoint, differences across countries' economic performance are explained by the complexity of connections, coordination and interactions among public and private organizations that make their National Innovation Systems advanced. In this context, one can say that the lack of coordination between the major objectives of public and private sectors and those of the other national institutions involved in industrial and technological policies can make vulnerable the national economic performance. And to understand National Innovation Systems, Nelson (1993) says that it is essential to understand how technical advance occurs in the modern world, and the key processes and institutions involved.", while Rosenberg (1993) declared that "Today, R&D facilities, staffed by university trained scientists and engineers attached to business firms, universities or government agencies, are the principal vehicles through which technological advance proceeds in fields such as.....", one can say that the literature has centered the evaluation and assessment of NISs on four types of knowledge or information flows which are as follows;

- 1) Interactions among enterprises,
- 2) Interactions among enterprises, universities and public research institutes;
- 3) Diffusion of knowledge and technology to enterprises, and;

4) Personnel mobility, focusing on the movement of technical personnel within and between the public and private sectors.

Since the first appearance of NIS concept, it has internationally started to change the main directions of innovation policies; this concept highlights the role of the cooperative interaction between individual innovative firms and other innovative organizations. Hence, this concept would be promoted especially when businesses, financial system, and research and academic bodies are included within a general system. Research group headed by Nelson compared the NISs of 15 countries, discovered that the dissimilarities between them reproduced different institutional arrangements, including: systems of university research and training and industrial R&D; financial institutions; management skills; public infrastructure; and national monetary, fiscal and trade policies. By the late 1990s, OECD had initiated broad comparative countrywide study of national innovation systems (OECD 1997, 2002), which produced support to the ideas of Charles Edquist (2001) and Jack Metcalfe (1998), that national innovation system is a comparative concept – there could not be an ideal national innovation system, which fits different nations with their specific socioeconomic, political and cultural background (Urmas Varblane et al, 2007). Nevertheless, a recognized model of a NIS does not exist and it is so hard for a particular NIS to be useful to another country by the same degree of performance. By the way, through case studies, Nelson and Rosenberg have emphasized that "we have been impressed by the diversity of 'national systems' that seem to be compatible with relatively strong, and weak, economic performance in particular contexts...partly is may be because the performance of the innovation system is a larger factor behind economic performance in some contexts than in others."(Nelson and Rosenberg, 1993, p.20); moreover they (Nelson and Rosenberg) have declared that"... since considerable differences exist when even comparing countries with similar economic conditions. The differences are caused by historical and cultural differences including the process of industrialisation, and have a role in shaping the legal systems and policies of a particular country."

As Schumpeter (1939, 59) said « innovation is possible without anything we should identify as invention and invention does not necessarily induce innovation, but produces of itself no economically relevant effect at all », and by the way, entrepreneurs are ones of key creator of innovation within the economy, whatever it is their degree of activities or performance, and even if they don't have such huge capacities or tools to innovate they can do it without anything.

While the US, the EU and Japan are still leading the world in the term of research and development efforts, they are being increasingly challenged by emerging economies, especially China. (UNESCO Science Report, 2010) The Arab World has been trying to improve its NIS over the last few years, although 95 % of the world researchers are found in Asia, Europe, and North America, whereas Africa, Latin America, Oceania, and Caribbean represent only 5% of the world researchers (UIS S&T statistics; 2005) this fact shows a huge gap between the north and south in the matter of research as well as GERD as a percentage of GDP (Algeria is still behind by 0.07 % GERD) (UIS S&T Database, 2008)

As we all probably know, the innovation system approach was employed using experiences of high income countries, with developed infrastructures and institutions, well built knowledge base, and well-functioning /economic systems, The situation of developing countries is rather different than those of developed economies. They have much lower income levels, a smaller amount of the role played by institutions and infrastructures on R&D aspects, and less accumulated knowledge. In addition, the foreign direct investments in the developing countries are playing much more important role than in the rich industrialised countries applying the national innovation system concept, but it's not the case for the less developed countries. Therefore the relationships between globalisation and national/local systems need to be further researched.

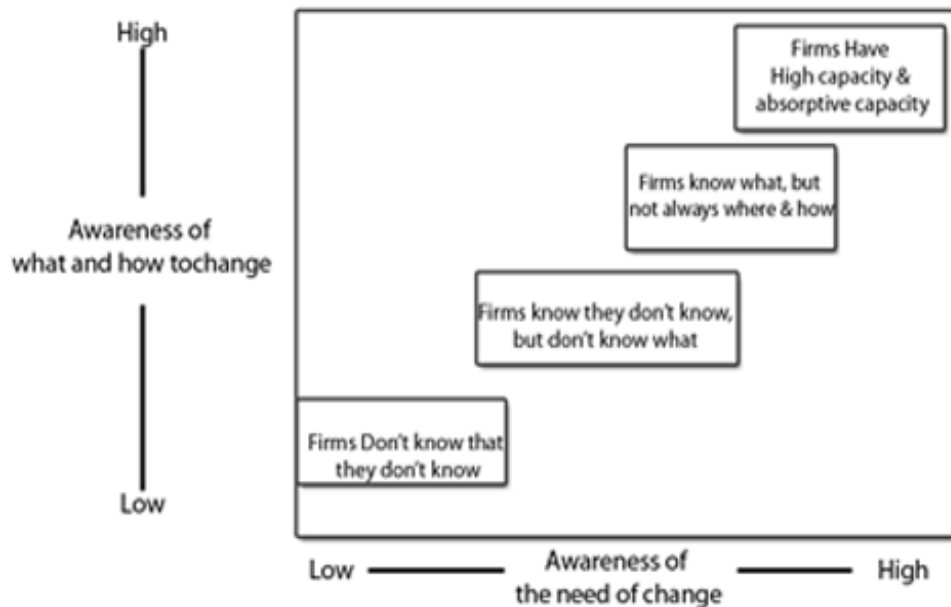
There exists fairly little analysis of organizations acting as obstacles to innovations, which is the case in less developed countries, Therefore instead of copying the adaptation of the innovation system, a different approach is needed in those countries. In order to meet the challenge of adaptation the innovation system for development processes,

After the systemic change in the early 1990s the role of linear innovation model still remained the prevailing innovation model for the policy-makers in transition economies. It has taken the form of the mystification of the role R&D, which reflects the misunderstanding about the mechanistic relationship between increased R&D spending and higher per capita GDP. R&D and innovation are often used as synonyms among the policy- makers in catching-up economies. The higher the expenditures on R&D, the higher is the innovativeness of society expected to be. Unfortunately this fetishism of R&D has been cultivated also in many recommendations given to the transition countries from various consultants and even in the EU recommendations. according to Urmas Verbalane et al (2007). there exist several

problems in the building up of NIS, as the reflection of path-dependency, such as the following ones;

- 1) Underestimation of the role of public sector in the national innovation system
- 2) Dominating role of the linear innovation model and neglecting demand
- 3) Confrontation between high- and low-tech industries
- 4) Overvaluation of the role of foreign direct investments
- 5) Lack of social capital and network
- 6) Weak innovation diffusion system and low motivation to learn

In 2002 the World Bank analysed the technological ability of firms to innovate and their internal willingness to change in Korea. Firms in the following figure are distributed into four groups based on the grade to which they are conscious of the need to change and the degree to which management is aware of what should be changed and how to go about changing it. At the lowest level are firms without any capacity for technological change and which do not feel any need for change; by the way, that is exactly the case of many firms in Algeria.



**Figure 1: Classification of Firms by Their Technological Capability and Motivation to Change**  
 Source: the World Bank, 2002.

The task of the innovation system in this case should be able to move firms up the ladder described in Figure 1. It requires activities in two dimensions. Firstly, to push firms to develop their capacity to absorb technologies from abroad and innovate by providing access to different sources of technologies. Secondly, to improve the internal motivation of firms to change, this requires providing data for firms about their relative position comparing with the best practises in the world.

### 3 What Drives Innovation?

In many ways the discussions made about innovation are not really new, boards are spending more time discussing innovation and what conditions and factors can drive the innovation process and especially that companies all around the world see innovation as a long game in which they can win or lose, thereby, they are continuously trying to tilt the odds in their favour, in order to win that game of innovation. In the recent few years the academic evidence appears to indicate that there exist four factors drive the innovation process of firms, which are:

- 1) The structure of the industry
- 2) The economic structure of the firm
- 3) The organizational structure of the firm
- 4) The historical development of the firm

The firm does not activate in a vacuum but in a very complicated environment full by several factors mainly those that construct and characterize the structure of its industry, which is a main



determinant of whether or not it innovates. Empirical evidences point out that firms in industries where innovation is necessary do innovate, and it is the case of those which are facing a strong competitiveness. However, the evidence also shows that the innovation process is a high risk, but potentially high profit venture, the fundamental uncertainty that cannot be totally taken off from the innovation process, can be limited in industries and environment which help innovative firms; mainly those that include a very sophisticated intra and inter-organizations integration. There are also two main drivers of innovation in the economic structure of the firm, which are the firm's size, and the second is based on the Teece/Itami view of the firm as a producer of information and other intangible outcomes. For the former, the studies that have been done have shown that there are large economies of scale associated with R&D and product development expenditures. While for the latter the stress is made on the firm as developing intangible and non-tradable properties. Firms with a combination of complementary assets can increase these assets over a number of potential products. Innovating firms according to this view invest more than non-innovating ones in both R&D and advertising, several studies have shown also that larger and more horizontally and vertically integrated firms are better innovators than single-product firms; while smaller firms are more flexible and successful at taking advantage of the external effects of R&D accomplished at other organizations, laboratories and universities; this free-ride permit them to recompense for their need of scale in R&D assets. In most innovative countries Innovations in small firms do not necessitate so many complementary assets, this reality is right enough to drive the smaller firms being innovative while they can sell or lease their innovations to bigger firms possessing the complementary assets to exploit as best as they can the product's potential. The third factor that drives innovation of a company is the internal structure of the company. Evidences in a great majority of researches that have been done in the domain of innovation have shown that the organizational structure of the firm has a huge impact on the innovativeness of the firm, mainly because Innovations need such an internal environment into which information, knowledge and skills are generated and capitalized into profitable products. Much of empirical evidence indicate a very common view that successful innovative firms are less than committed to, they have such an integration of innovation strategies with corporate strategies that allow them to facilitate and insure their working processes and their cross-functional teams' activities. Clark Wheelwright and Hayes provide a remarkable scheme that stresses on the relationship between the management role and its weight on new product development processes.

### **3.1 Measuring innovation**

There exist several ways to measure innovation, but the most used measures are known as the traditional measures of innovation, which are R&D expenditures and patents. Following many studies in this domain since the 1950s, R&D expenditures can be regularly collected, usually on an annual basis, in several countries, while patent data have been collected since an earlier period of the 19<sup>th</sup> century, in the case of Algeria, patent data are available on the INAPI database.

### **3.2 Innovation and patents**

It is widely known that patents provide protection for the invention to the owner of the patent, thereby, the invention cannot be commercially made, used, distributed or sold without the patent owner's permission, this protection is required in today's market and especially with all the emitted products and services that are found in the market, generally this protection is granted for a limited period, which is 20 years in almost all the cases, and sometimes less; in this period, only the patent owner has the rights to give permission to or licence other parties to use the invention on mutual agreed terms, he may also sell the rights to someone else, as he may give them to that new owner; for free. Once a patent expires, the protection ends and then the invention becomes available to commercial exploitation by the others, and the owner no longer holds exclusive rights to the invention. In fact, All patent owners are obliged, in return for patent protection, to publicly disclose information on their invention in order to enrich the total body of technical knowledge in the world. Such an ever-increasing body of public knowledge promotes further creativity and innovation in others. Empirical evidence has shown that there was no relation between a country's score on this index and its economic growth. Increasing IP rights tend to be correlated with R&D spending, but it turns out the causality goes the other way: first a country starts spending more on R&D, and then later they increase IP rights strength. In this way, patents provide not only protection for the owner but valuable information and inspiration for future generations of researchers and inventors. In Algeria a patent may be granted from the INAPI (*Institut National Algérien de la Propriété Industrielle*), which first of all requires the person who asks for the patent to fill up a patent application which contains the name or the title of the invention its self,

the indications of its technical field, the background and the description of the invention as well as the drawings, plans, or the diagrams to better describe the invention.

In 2006 the INAPI received 477 patent demands from national companies, while the whole demand for patents was 514 demands, which is really limited comparing with other countries, and even though for that raise in patents demand, from a year to another in the last decade, patenting is still need to accelerate further; the case was the same for trademarks demand from the INAPI office because it was only 2682 demands in September 2006; with a raise of 244 demands comparing with 2005. the same organization received 2875 trade mark demand to extend into the Algerian market from foreign companies, while the number of these demands was counted by 3665 demands, 31 patents was the number of the accepted patenting demands in 2006 by the INAPI, from the whole 477 demands, sometimes the rejection of these demands was because of the missing files or the uselessness of the invention its self, while some of them was because of the policy of the INAPI, and the wasted time concerning each of the preparation and the patents' demands studies, and so on...through some interviews with local Industries from which have already asked for their patents as well as the local commerce chamber, there was obviously a huge gap in time between the demands and the acceptance/rejection of the files, which is counted as a main problem and obstacle for Industries to get the industrial property rights of their invention. The next Table (Table 2) illustrates the patents' demands, registrations and renewals for national trade marks in the INAPI office in the first three trimesters of 2006 concerning national and foreign companies, this table shows that 554 demands was accepted from the number of 1664 demands of trade marks from national companies, while 546 trade mark was registered from 1018 foreign demands, while only 128 national trade mark have renewed their patents in that period in addition to 487 foreign ones have been renewed in the same period of 2006. In 2007, the WIPO received 84 Patent applications from the Algerian office of patents, while it was 58 applications only in 2006 and in 2008 the number was planned to be extended but data are not available neither at the WIPO's nor at the INAPI's official web sites. It was 59 in 2005 and 58 applications in 2004. (See the WIPO Statistics Database, December 2009)

**Table 2: Deposits, Renewals, and Registration of National Trademarks (Period from 01/01/2006 to 09/30/2006 :**

Country of origin	Deposits	Registration	Renewals
National	1664	554	128
Foreign	1018	546	487
Total	2682	1100	615

**Source: The INAPI web site**

According to the WIPO (WIPO, 2012) a considerable increase has been witnessed in patents granted to both resident and non-resident applicants in Saudi Arabia and Algeria.

Table 3 which is bellow demonstrates some statistics of patents taken from the INAPI data base, it illustrates the number of Patents delivered for national Industries by the INAPI, and the number of patents demanded in the period between 1988 and 2007, we have asked the INAPI offices for recent statistics of this kind, but each time we called they kept saying that it is still confidential and that they cannot offer us such information, because they do not concern the INAPI itself but also the local Industries which have asked about the patents of their products and services, as well as the ministry of the industry, anyway; was 214 in the date of 2007, while it was 590 patents in 2006 and 550 in 2005, with the exception of the drop of the number of patents in 2007, comparing with the previous year, patents number was raising by time in the last decade, while it was not steady in the 1990s; mainly because of the social, political and economic situations in that period. Algeria now is in the right way to strengthen the patents policies within the local market, with so many laws and texts through which companies will be able and sometimes obliged to register their inventions and trademarks.

Comparing with other African countries the Algerian Resident patent filings per \$billion of Gross Domestic Product in the period between 1995 and 2007 seem to be very much low than these of the other countries in the table even the countries which have the same and even a lower income, such as Zambia, Kenya, Madagascar, and even Tunisia, the less than 0.35 billion from the GDP is considered to be low comparing with Egypt which gives more than 1.35 billion for the same year (2007), while Tunisia gave 0.87 \$Billion in 2005 for resident patent filings, that may be because of the reason that in Algeria this kind of expenditures is financed by public sector only, which is the case in Saudi Arabia, and Morocco.

**Table 3: Resident Patent Filings Per \$billion Gross Domestic Product\* (1995-2007)**

Country of Origin	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Algeria	0,18	0,30	0,20	0,24	0,20	0,17	0,27	0,22	0,14	0,26	0,25	0,24	0,34
Egypt	1,88	2,21		1,97	2,02	1,91	1,60	2,11	1,61	1,20	1,29		1,35
Kenya		0,40	0,58	0,69	0,63							0,74	
Madagascar	1,83	0,60			0,68	0,50		0,31	0,21	1,08		0,25	
Malawi	0,15	0,28	0,27	0,26	0,12	0,37							
Saudi Arabia	0,08	0,07	0,15	0,12	0,19	0,19	0,11	0,15	0,13	0,17	0,24	0,24	0,24
Tunisia	0,78	1,06	0,92	0,81	1,35	0,90	0,40	0,81	0,60	0,74	0,87		
Zambia	0,43	0,60			0,48		0,53						

Source: WIPO Statistics Database and World Bank (World Development Indicators), June 2009

\* Data Based on 2005 Purchasing Power Parities

According to the WIPO statistics database (2012) the number of PCT filings in 2007 is higher than the 2002 level. Algeria, Turkey and Saudi Arabia had the most notable increase (average annual growth) in PCT filings. However, the combined share of all reported emerging countries in total PCT filings was only 2.5% in 2007.

#### 4 Innovation and R&D:

The theoretical background of innovation, and R&D considers R&D as a main driver of innovation performance and is then a determinant of the innovation level of any country, R&D comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. R&D is a term covering three activities: basic research, applied research, and experimental development. Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view. Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed. The main aggregate used for international comparisons is gross domestic expenditure on R&D (GERD). This consists of the total expenditure (current and capital) on R&D by all resident companies, research institutes, university and government laboratories, etc. It excludes R&D expenditures financed by domestic Industries but performed abroad. Several methods and concepts may be in the use of measuring the R&D activities of an economy, such as the R&D impact on innovation, the NIS GERD, and the number of researchers... (Metaiche, 2010).

#### 5 Measuring Innovation in North African Countries

It is widely accepted that there is a huge gap between the north and south, in all areas and domains including social, economic, organizational, and so on, this gap concerns also the R&D and innovation sector between the north and the south. Many Developing countries, like Maghreb countries (Algeria, Tunisia, Morocco) innovation systems construction takes place in a very specific environment characterized by privatization of public concerns, the rise of a strong SMEs sector but with very little experience in the fields of R&D and innovation, and a relatively weak industrial sector in terms of industrial performances, suffering high obsolescence both in terms of human resources and equipment (Djefflat A., 2008). The performance of research and innovation of Industries and universities from the North bank is very high and dynamic compared to the other bank. In most Maghreb countries, policies are being worked out to establish ITCs in key strategic sectors: textile, garments, mechanical, electrical, food industries etc. ((Djefflat A., 2008); it has been illustrated in the previous part of this work the portion of the Arab countries does not exceed 0.5% from the global scientific publications (all disciplines included), and the GERD does not exceed the average of 1% in almost all the countries, if not pretty much less than that; GERD can show the real picture of these countries in research which is

very limited and does not really contribute in the accumulation of knowledge and enhancement of the productive system. In Algeria, for instance, the GERD has been improving by time in the last decade, but even though that enhancement it (GERD) represented only 0.35% from the GDP in 2004; and research is almost 98% funded from public organizations but there are not any tools or programs to make it concrete and valuable, in Algeria also The creation of innovating Industries is exclusively the mission of large enterprises such as Sonatrach, Sonelgaz, Electricité d'Algérie, SAIDAL.. (Khalfaoui, 2006). While for Tunisia and Morocco, there is a little light concerning GERD and the existence of programs to motivate R&D and innovation, but research is still largely financed by public sectors. Moreover; these three countries possess only few patents in the European offices of patent while the patent applications of these three countries are totally absent in the American Office of patent (OST 2006). Algeria ranks 120 out of 127 (2007) in the BCI subindex "Sophistication of company operations and strategy", while in 2004 it was still 87th; this is surprising, as the countries ranking in "availability of engineers and scientist" (GCI) is excellent (25th, better than Austria, UK, and Netherlands). (Jörg Janischewski, Katja Branzk, 2008). the integration of innovation and R&D activities in the private sector in Maghreb countries seems to be limited mainly for the reason that these activities are not a part of the business proprieties of local Industries in these countries owing to the low rates of technological intensity of these countries, with slight differences between sectors as well as between countries. For instance, the major orientation of scientific and technological innovation policy of the Tunisian governments consists of encouraging enterprises and industrial support institutions to integrate innovation, technology transfer and R&D in their strategies; the following key Characteristics of the algerian NIS may explain a lot about the problems and obstacles facing innovation of the algerian companies;

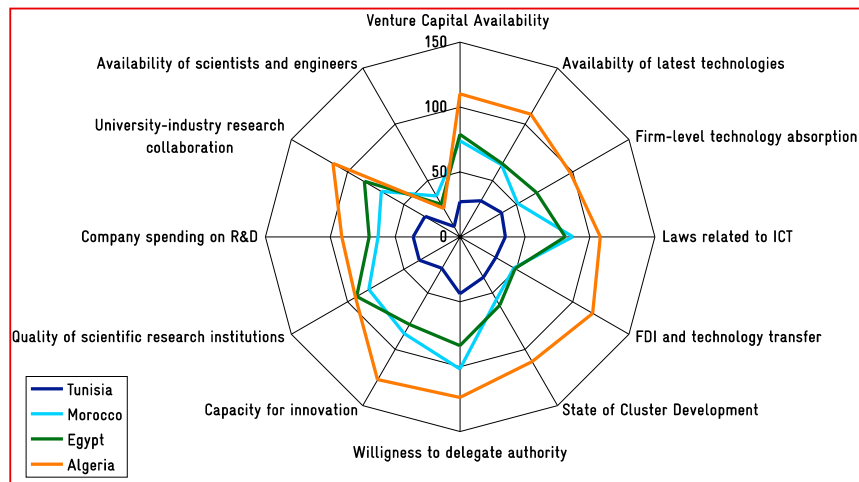
- 1) Centralised system with plans to decentralise operational support for enterprise development
- 2) Emerging awareness of the importance of private equity and an embryonic venture capital industry
- 3) The need for legislative reform to support private equity is currently being addressed.
- 4) However there are essentially no links between industry and academia. A considerable effort will be required to develop appropriate structures.
- 5) The higher education and public research system is weak and needs to be developed in parallel with industry reforms. There is no Research For Technological Development and no Innovation policy and the overall development of intermediaries is weak. (European Trend Chart on Innovation; 2005)

During the last decade, trans-national Industries were considered as the main driver of R&D activities globalization, the R&D activities in these Industries represents almost the half of the global R&D activities and expenditures, and more than 2/3 of Industries R&D activities, R&D expenditures, as well as R&D activities have emerged in the last decade only to reach uncourageous rates in some emerging countries, mainly situated in Asia such as in China, and India, while it is still limited of Arab countries which constitute around 3.5% of world GDP and more than 4% of world population, but Arab countries consume around only 0.4% of the Gross Domestic Expenditure on R&D (GERD) and then The Arab world is not investing enough of its economic resources in technology, and was ranked last – even lower than African countries. By the way, a most recent statistics reveal that 89-97% of R&D expenditure in the Arab world is funded by the public sector. By contrast, more than 50% of R&D expenditure in developed economies is funded by the private sector. (Abdallah Alnajjar, 2002). More than few Industries generally in Arab countries and particularly in North African countries do not have an R&D account in their accounting system. Even if they have already undertaken R&D activities but their R&D expenditures are null. These activities are then funded by another budget. For all Maghreb countries, major efforts have been made to launch innovation, meanwhile; all numbers and facts show that innovation output remains relatively poor in these countries. (Djefflat A., 2008). Meanwhile, almost the totality of the Arab countries has become a destination for some Industries that aim to invest in R&D activities in so many sectors and not only strategic sectors as the case of the last few decades, and by the way, one of the main problems within Maghreb countries which limits R&D activities and then innovative activities for Industries is somehow the high rates of unemployment of well educated and skilled people, and sometimes the time gap between the degree/study accomplishment dates and the dates of being employed, because it works to limit the possibilities to enhance the skills and knowledge gathered and improved at universities and educative centres, and it also bound the knowledge value of those people; which in one way or another will affect the innovative capacity of the Industries; as well as product launching either within or outside the local markets of these countries; Thereby, the value of the R&D activity of the firm is directly related to the core competencies and knowledge of this firm as

well as to its efficient innovative processes. Baldwin & Hamel, (2003) and Duguet, (2000), have proven that the Industries which have higher rates of expenditures on R&D activities have the most competitive advantages in the radical innovation and claim more inventions rights. The poor institutional and incentive regimes of Maghreb countries may be one of the most important causes of the small absorptive capacity of these countries. (Djefflat A., 2008). However, The increasing integration into the world economy raises new challenges for the Algerian productive sector, particularly the industrial sector, which must face increased competition and whose consolidation largely depends on greater business competitiveness. If its transformation is to succeed, the Algerian productive sector must not only be capable of facing competition from imports but also be capable of exporting.

The MENA comparison with regard to selected key indicators describing innovation performance (GCI) sees Tunisia considerably ahead in most aspects, and Algeria far behind (lower ranking reflects better performance). (see figure below)

**Figure 2 The MENA Comparison with Regard to Selected Key Indicators of Innovation :**



**Source: Jörg Janischewski, Katja Branzk, 2008**

According to Jörg Janischewski, Katja Branzk, (2008). Algeria ranks 127 out of 131 countries in “capacity for innovation” (at the company level) according to the GCI, due to relative market isolation and their “planned economy mentality”. Unlike many other countries, financial resources would be available. Nevertheless, Algeria has begun to develop elements of a national innovation policy; including the elaboration of an innovation policy, training of SMEs, financial support schemes, establishment of an Innovation Observatory, incubators and innovation-related organizations as well as reinforcement of the technical centres. (Jörg Janischewski, Katja Branzk, 2008.)

## 6 The Field Study

Our study is based on the innovation survey which we used to measure the innovative activities for the Algerian Industries; a sample of 250 Industries were contacted either electronically via emails or via phone and even personally by the authors. Those Industries have been asked to respond to a questionnaire that includes, besides their principal characteristics (such as the firm’s size, the business field, beginning date for the firm’s activity...), several questions related to R&D and innovation activities, (R&D intensities, skilled employees’ numbers, level of innovation, innovation obstacles, innovation performance, cooperation with universities, labs, other Industries and organizations, we have also taken into consideration the management of innovation, through asking some questions, either related or unrelated to each others but they all fall in the same aim which is to evaluate the innovation management within these companies

**Table 4 Variables Description and Findings**

Name of variables	Type	Value
INNO	dichotomous qualitative	1= the firms has already undertaken process or product innovation 0=otherwise
RD	dichotomous qualitative	1= the firms has R&S activities 0=otherwise

RDI	multinomial quantitative	0 no R&D expenditures 1 very small R&D expenditures 2 average R&D expenditures 3 high R&D expenditures 4 very high R&D expenditures
SIZE	Multinomial Quantitative	1 1-9 employees 2 10-49 employees 3 50-249 employees 4 250 employees, and more
MKGI	multinomial quantitative	0 no marketing expenditures 1 very small marketing expenditures 2 average marketing expenditures 3 high marketing expenditures 4 very high marketing expenditures
COO	multinomial quantitative	0 no cooperation with other organizations 1 very small cooperation levels 2 average cooperation levels 3 high cooperation levels 4 very high cooperation levels
MAR	multinomial quantitative	0 no marketing integration into other departments 1 very small marketing integration 2 average marketing integration 3 high marketing integration 4 very high marketing integration
QI	multinomial quantitative	0 no qualified employees, at all 1 very small intensity of qualified employees to the total number of employees 2 average intensity of qualified employees 3 high intensity of qualified employees 4 very high intensity of qualified employees
OBLEV	multinomial quantitative	0 no innovation obstacles at all 1 very few innovation obstacles 2 average level of obstacles 3 high level of innovation obstacles 4 very high level of innovation obstacles

According to the survey, almost all the contacted companies do not have R&D departments, and then both R&D and innovation activities are included in other activities such as production. And many of them gather R&D spending to the cost of employees' training, product improvements and patents acquisition... in ways that enlarge the numbers of GERD.

In our first model we take the business characteristics as independent variables besides the specific characteristics of the firm as well as the whole sector of activity, for each firm. Our objective from this model is to estimate the impact of each variable on the probability of innovation in the Algerian Industries. The impact of the innovation obstacles is taken in consideration in each of these models, as well as the firm size, the firm's cooperation with other organizations and the skilled employees. We also take RD as a qualitative dichotomous variable which measures whether the firm has already undertaken R&D activities or no, this Model has as objective to see whether the R&D activities in the Algerian Industries have the same importance as in foreign countries or no, but obviously, most of Algerian Industries do not have R&D activities and in case they do some activities which have the same characteristics either for the reason that they do not call them R&D or they include these activities into other departments and functions inside the firm, such as the production activity, Quality, or even Marketing.

This Model takes in evidence the Marketing activity and its integration to other functions and activities within the same firm, we have seen that cooperation and marketing integration have a positive impact on the firm innovativeness as well as the innovation performance of firms, so we aimed to measure the integration levels of marketing functions to other functions within the firm, and the firm's cooperation with other organizations, and institutions including universities, research labs, firms and so on...

We use this model in order to estimate the impact of each variable on the probability of innovation in the Algerian Industries; taking in mind the impacts of Marketing intensity (MKGI) and Marketing

integration (MAR).<sup>1</sup>

In the second model, we try to check out the impact of all the variables taken in “model 1”; with the exception of the existence of marketing activities, and the marketing intensity of the firms taken in this study, while in this time, we link between the marketing activities integration and the firm’s cooperation mainly because there exist empirical evidences that both internal integration, and external cooperation have a positive impact on each others and that they are correlated to each other in so many ways. Because the significance coefficient is 0.11 for the 2-tailed, bivariate correlation between the two variables (COO, and MAR) while the correlation is significant at the 0.05 level. In this Model we take both COO and MAR as correlated variables in the second equation.

We try to check the effect of Marketing efforts on innovative activities of those firms with and without taking “Marketing” variables in mind, while the theoretical background of both innovation and marketing, show the massive impact of these two concepts on each other, we still need to see the results of our study concerning those variables.

**M1:**  $INNO = \beta_0 + \beta_1 SIZE + \beta_2 RDI + \beta_3 MKGI + \beta_4 COO + \beta_5 MAR + \beta_6 QI + \beta_7 OBLEV$

**M2:**  $INNO = \beta_0 + \beta_1 SIZE + \beta_2 RDI + \beta_3 (COO * MAR) + \beta_4 QI + \beta_5 OBLEV$

Through these two models we aim to validate or invalidate the next two hypotheses;

**Table 5: Classification Table (a,b)**

Observed		Predicted			
		whether the firm is innovative or not		Percentage Correct	
		NO	YES		
Step 0	whether the firm is innovative or not	NO	43	0	100,0
		YES	13	0	,0
Overall Percentage					76,8

a Constant is included in the model.

b The cut value is ,500

**Table 6 : Variables in the Equation (Model 1)**

	B	S.E.	Wald	df	Sig.	Exp(B)	
Step 0	Constant	-1,196	,317	14,285	1	,000	,302

Source : Metaiche M.A., 2010.

**Table 7 : Variables in the Equation (Model 1)**

			Score	df	Sig.
Step 0	Variables	SIZE	13,285	1	,000
		RDI	34,031	1	,000
		MKGI	11,146	1	,001
		COO	40,068	1	,000
		MAR	8,932	1	,003
		QI	28,690	1	,000
		OBLEV	9,305	1	,002
		Overall Statistics		46,187	7

**Table 8: Variables in the Equation (Model 2)**

	B	S.E.	Wald	df	Sig.	Exp(B)	
Step 0	Constant	-1,196	,317	14,285	1	,000	,302

<sup>1</sup> In this Model; We exclude the variable (MDG) that takes in mind the existence of the marketing department within the firm, because it is not necessary for firms to have marketing departments in order to do marketing activities; and as we noted earlier in this work, there have been found so many firms which are so active in the marketing tasks and activities, but they do not have any Marketing departments neither inside their firms, nor in their accounting systems.

**Table 9: Variables not in the Equation (Model 2)**

Step 0	Variables		Score	df	Sig.
		SIZE	13,285	1	,000
		RDI	34,031	1	,000
		QI	28,690	1	,000
		OBLEV	9,305	1	,002
		COOMAR	29,590	1	,000
	Overall Statistics		41,511	5	,000

Source : Metaiche M.A., 2010.

We have found a positive relationship between the dependent variable and all the independent variables except for QI for the tow Models (1 and 2), and OBLEV for the model 2, while it was insignificant for the model 1, from the study that we have made, we found a positive impact between the firm's size and R&D activities as well as the firm's innovativeness and innovation performance, we must notice here that so many theories as well as empirical studies found that innovative firms which spend more resources on R&D and innovative activities, get bigger and bigger with the time impact, and especially that it benefits from the profits made by the innovation itself, meanwhile, The algerian companies are facing some difficulties in transforming their research efforts into Development efforts. for the Algerian companies taken by this study, most of them are public owned companies, where employees are logically seem to be numerous, and the most innovative firms in Algeria are big public firms with more than 250 employees, at the same time as the private sector plays a little role on the Algerian innovation activities, either counted by R&D intensity or by the innovations done within the national market.

## 7 Conclusion

Innovation is not a choice, it is becoming more and more necessary , day after day, mainly because we are living in an open market which is challenging us, "industries must Innovate or disappear" " (Djeflat, 2008)

In Algeria, both the private and public have invested in R&D centers mainly those situated within the local universities, as a result fort that, we find out that 90% of the local researchers are researchers at the university; and because of the structural weaknesses that face the links between universities and industry (less than 10% of companies in Algeria have links with the university), we can see how much efforts must be done in this field. Both private and public actors have to open their borders to each other, and work together in ways that foster innovation. (Ouchalal et al., 2007) while, one of the key issues facing the construction of a well functioning innovation system in Maghreb countries may be defined as the level of human, financial and institutional ingredients. (Djeflat A., 2008).

While the most important factor of innovation is driven by the R&D activity; Djeflat (2008) argued that creating new institutional university-industry links, and strengthening the existing ones, is a key solution to foster the innovation activities for the Algerian economy. Moreover, several results can be derived from this study, which are of interest to show the innovation level of Algerian Industries. First, the significant estimates in the logistic model recommend that Algerian Industries have to extend their efforts in innovation through raising their R&D activities, and by improving the number and quality of their skilled workers both via adopting short and long-terms training activities as well as by collaborating with other technological organizations. Second, "

Third, both the government and national economic actors must find a solution to enhance the foreign direct investment and exports of Algeria, this might help the economy to become more creative and will certainly improve the Industrial competitiveness of the country, through adopting new partnerships and collaboration agreements with foreign economic actors. And especially that foreign direct investment in Algeria is concentrated mainly either in the petroleum and gas sector, or in the low intensive technologies sectors; but firms' executives have generally a good sight for the future and who are trying their best making their firms more creative and more innovative in the future through adopting certain strategies which allow employees being creative within their organizations, they are aiming to raise the R&D and Marketing intensity of their firms in order to know how to satisfy their customers. The Algerian Industries' innovativeness rates are very low, but we have shown that these firms do innovate, so that we have unaccepted our second Hypothesis, which says that Algerian Industries do not innovate, and even if these firms do not make radical innovations but at least they do some efforts to be



innovative, we have to notice here that both the economic structure and characteristics of the local market are ones of the most problems facing firms in their ways to be innovative, and even if the government is helping firms in so many ways, but there exist so many problems and obstacles that must be faced and resolved by both governmental and non-governmental organizations, the collaboration of the economic actors is so necessary to enhance the firms' innovativeness and innovation performance of the local firms in ways that help them being competitive within and outside the local market. Firms also have to be aware of the barriers to innovation which impede the firms' innovativeness and economic performance, the linkages and cooperation within the firm between Marketing and R&D departments are also so vital for the innovative activities of the firm in order to check out the roles played by marketing to enhance the innovativeness and competitiveness of firms; The requirement of rapid adjustment to dynamic changes reinforces the function of knowledge flow in inter-functional relations. The obligation of integrated knowledge is the most precise in the relations of R&D and marketing, researchers are increasingly aware of its key role in innovation. Innovation barriers in Algeria as well as other Arab countries have been reduced in the last decade but there still so much effort to be done in this aim, mainly through gathering the efforts of both Governmental and non-governmental organizations, and second, there is the role played by the firms themselves, and especially if they act as a one-unit, through creating linkages and networks between them. Nucleus programmes are a good example of these Networks that may help firms succeeding and strengthening their activities either inside or outside Algeria. We notice here that innovation will take place only if the result on the market acknowledges the creative idea, thereby, if the products and services developed with novelty are successfully sold, so that Innovation must rely on marketing activities to succeed, and they need to be linked and integrated either before, during or after the development process of the new product, our study shows that in most cases the integration of marketing and R&D is at much lower level than expected within the Algerian Industries. But it shows also that Algerian Industries are somehow innovative but their innovation rates do not help them being really competitive on the international market, and thereby they have to work collectively as well as individually in order to face the economic challenges and obstacles to improve the economic performance of the whole economy. The potential and capacity of firms for innovation does not only depend on technological and financial resources. Innovation requires expert know-how in a lot of areas such as management, production, the innovation process, intellectual property rights, marketing, and cooperation skills and so on.

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# The Inter-correlation Analysis Between Remuneration Satisfaction and the Behaviour of Staff Demission in Original Equipment Manufacturer

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**Abstract:** The role that Original Equipment Manufacturer established in China played in the global manufacture industry is of vital importance, but in the process of development, the potential risks derivates with the employee remuneration system. According to the satisfaction of employee remuneration, the satisfactions of Original Equipment Manufacture compensation is categorized into five aspects, which are remuneration system, remuneration structure, fairness of remuneration, incentive motivation and welfare policy based on related literatures. The fairness of remuneration is used as intermediary factor to examine the effect and linkage of remuneration and initiative suspend from the work. The tentative results have verified convinced relationships between those five factors, and find the negative inter-correlations of remuneration satisfaction and initiative demission. Several recommendations were put forwards as corresponding suggestions.

**Keywords:** Equipment Manufacturer; Employee Remuneration Satisfaction; Regression Analysis

## 1 Introduction

With the transferring of global manufacturing center, a growing number of international enterprises put their emphasis on China which leads the tag 'Made in China' an outstanding place in global manufacture industry, and the Original Equipment Manufacturer (OEM) are booming among the wave. OEM refers the concept that one company manufacture products and related accessories based on the specific requirements of the other company, it is also called manufacturing brand-name goods or manufacturing under the trademark-specified production. The OEM enterprise operates on the basis of authorized contract, providing products and services to other enterprises and companies. Along with the financial crisis, OEM enterprises are facing enormous challenges, such as the "labour shortage" in the coastal areas and the suicide accident of FOXCONN in the first half of 2010, those series of incidents disclosure the severity for employee remunerations.

In historical view, most of researchers aimed their eyes at the relationship among the elements of remuneration satisfactions, while theoretical and empirical literature rooted on the risk and inter-correlations between employee remuneration satisfactions is fairly rare. This paper will make clear the inter-correlations between remuneration satisfaction and the behaviour of staff demission, which will be precisely the theory basis for those OEM enterprises to improve their remuneration management and the initial purpose to conduct this research proposal.

## 2 Theoretical Framework

### 2.1 Remuneration satisfaction

The concept of remuneration satisfaction derived from a combination of theory and practice, it is mainly based on the equity theory, Adams (1956) first proposed the concept of remuneration satisfaction in the *Advances in Experimental Social Psychology* in which he considered it due to individual feeling from the pay fairness, and this feeling came from a complex process of perception and comparison. Since then other scholars approach different definitions of the pay satisfaction, Lawler (1971) regarded it as the employees' different perception from expected income and actual income. Singh and Loncar (2010) defined it as the feelings of the comparison from remuneration and non-economic reward with their expectations. In fact, remuneration satisfaction is the link between remuneration and individual behaviour, which is a direct reflection of the attitude for the individual pay fairness.

### 2.2 Factors of Remuneration satisfaction

Remuneration satisfaction affected by various factors, Herbert.G.Heneman and Donald.P.Schwab (1978) first proposed the concept of multidimensional pay satisfaction, they thought that remuneration level, welfare, remuneration promotion and remuneration structure/ management satisfaction were the four dimensions of the remuneration satisfaction. And others as Jason D.Shaw and Michellek.Duff (1999) found that the salary policy with remuneration satisfaction and remuneration level with

remuneration satisfaction was basically having positive inter-correlation. While Chinese scholars Zhao Yong (2006) showed that negative emotions had no influence on remuneration satisfaction, and the positive emotions and remuneration satisfaction are positively correlated, whereas the relationship was destroyed when the pay levels achieve critical mass.

Combing research situation, taking the national conditions of China and the special culture and management of OEM enterprise into account, this paper will separate the pay satisfaction into five aspects—the remuneration system, remuneration structure, remuneration fairness, welfare policy, and intrinsic motivation. The remuneration system reflects the overall satisfaction on pay system, including the reasonableness and fairness of the system, and the satisfaction of the incentive remuneration system; The remuneration structure reflects staffs’ satisfaction on the formulation of the salary structure and itself; Remuneration fairness reflects the satisfaction of internal equity and external competitiveness for the salary; Welfare policy reflects the overall perception of itself while the intrinsic motivation reflects the satisfaction of the intrinsic motivation effects, including a salary perception of their own career development and value.

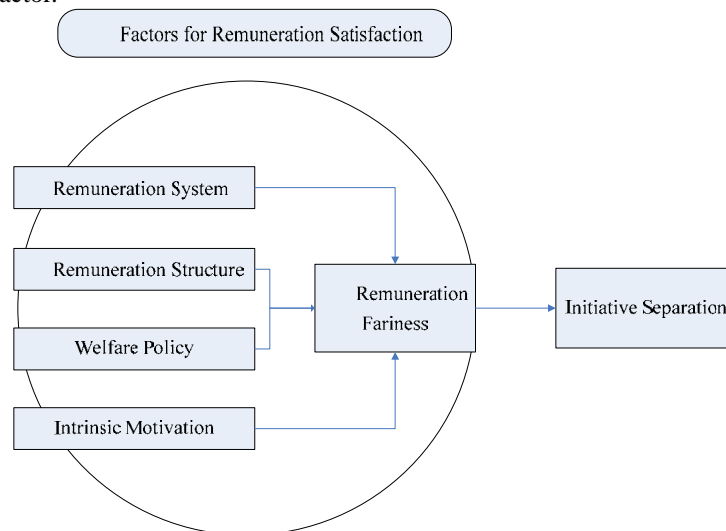
**2.3 Low remuneration satisfaction for employee behaviour**

Low remuneration satisfaction may produce a lot of negative impact on staff, while the most serious behaviour is demission. For this reason, many scholars had focused of their attention on the relationship between the remuneration satisfaction and abdicative behaviour. Study found that the salary unfairness will cause many behaviours such as slack working, being refused to help, leaving intention, the negative attitude to the supervisor, and the violation of discipline and et al. (Colquitt, 2001). A researcher (Randall of S. Sexton, 2005) explained why employees would like to abdicate and how to prevent brain draining, they found the unsatisfied remuneration having a directly impact on employees’ demission. Timothy A. There was a limited positive relation among remuneration level, staff’s working and remuneration satisfaction. While after Empirical research (Judge et al., 2005), while salary and welfare satisfaction had a negative influence on abdicative intention (Xiang Cong, 2006). In general, the higher pay satisfaction, the lower turnover tendency, which will lead to a positively working.

By summarizing the above literature, the authors suggest that remuneration satisfaction would bring with varying degrees of impact to employees, and higher satisfaction allows employees to work more actively, while the lower satisfaction lead negative impact to them. However, the worst negative affection may cause demission, as will make a significant impact on the development of the enterprise.

**2.4 Theoretical assumptions**

Based on the above review, it can be found that the initiative demission is the most significant risk behaviour for staff, so this paper studies the relationship between salary satisfaction and initiative departure. Owing to the fact that the remuneration satisfaction and behavioural risk are closely related, in fact the two item are positive correlated (Jason D.Shaw and Michellek.Duff, 1999), so we pretend that the remuneration fairness play an intermediary role in remuneration satisfaction factors. By studying the relationship of the various elements with remuneration fairness, the further research of the correlations within remuneration satisfaction and initiative separation can made remuneration fairness as an intermediary factor.



**Figure 1 Theoretical Model**

So we establish the following model (see Figure 1) and hypotheses:

- H1: The remuneration system and remuneration fairness have a significant positive correlation.
- H2: The remuneration structure and remuneration equity have a significant positive correlation.
- H3: The welfare policy and remuneration equity have a significant positive correlation.
- H4: The intrinsic motivation and remuneration fairness have a significant positive correlation.
- H5: The remuneration fairness and the initiative demission have a significant negative correlation.

### 3 Study Process

#### 3.1 Samples and scale

The object of this investigation is the foreign OEM enterprise, We totally issued 500 questionnaires, and actually received 432 ones, representing a satisfactory effective response rate of 86.4 percent, excepting for incomplete and significantly biased questionnaire, the final number is 379. The data collecting of the questionnaire includes two parts, the background information of the respondents and the main subject, which is divided into six parts, respectively for the remuneration system, remuneration structure, remuneration fairness, welfare policy, intrinsic motivation and initiative separation, by which the first five part referred to the pay satisfaction questionnaire.

The questionnaire uses the Likert five-point scale, so that the subjects can use 5 levels——strongly agree, agree, not sure disagree, strongly disagree to measuring the feelings, and respectively correspond to endow with a value——5 points, 4 points, 3 points, 2 points, 1 point, the option “1” represents “strongly disagree”, “5” represents “strongly agree” to arrive at each satisfaction factor of the actual experience score.

#### 3.2 Reliability and validity

This research use SPSS17.0 software to carry on data processing and analysis. First of all, by using Corrected Item -Total Correlations (CITC) to examine the construct validity of six parts. CITC is used to examine the inter-correlation of the measure index and its dimension by choosing the CITC value is less than 0.4 index, if each coefficient and total coefficient has been improved when deleted the item, the action should be carried on. After relativity verification we deleted 7 items (B4\C15\C16\H1\H3\H5\H7). We used alpha consistency’s coefficient to test the whole questionnaire and gains an acceptable level of Cronbach’s alpha coefficient which distinguish to 0.921, 0.897, 0.952, 0.904, 0.921, 0.788, so the results are credible.

#### 3.3 Descriptive statistics of the variables

The first glimpse on the descriptive statistics for each variable was achieved by examining the Person correlation matrix (see Table 1). The data showed that five parts of the pay satisfaction scales’ average were between 3.00 to 3.84 which means the overall level of satisfaction is not high and the correlation between each variable in the range of 0.490 to 0.817, all reached a significant level.

**Table 1 Means and Correlations for the Variables**

Variables	Mean	1	2	3	4	5
Remuneration Fairness	3.41	-				
Remuneration System	3	.817**	-			
Remuneration Structure	3.23	.786**	.746**	-		
Welfare Policy	3.66	.725**	.625**	.704**	-	
Intrinsic Motivation	3.84	.685**	.590**	.715**	.646**	-
Initiative Separation	3.39	-.575**	-.490**	-.595**	-.547**	-.719**

Notes: \*\*P<0.01,\*P<0.05

#### 3.4 Remuneration satisfaction to initiative separation

We yielded remuneration system, remuneration structure, welfare policy and intrinsic motivation to be independent variables and make regression analysis with remuneration fairness. The results (see Table 2) suggested that the Durbin-Watson statistic is 1.642, as it means there was no obvious correlation between residuals, and the model could explain 77.3 percent of the variation in remuneration level, telling us the regression model was established with statistic significance.

**Table 2 Model Summary<sup>a</sup>**

Model	R	R2	Adjusted R2	F Change	Sig.F Change	Durbin-Watson
1	.881a	0.775	0.773	322.916	0	1.642

a. Predictors:(Constant),Remuneration system, Remuneration Structure, Welfare Policy, Intrinsic Motivation

b. Dependent Variable: Remuneration Fairness

**Table 3 Coefficients<sup>a</sup>**

Model	Coefficients		t	Sig.
	Unstandardized	Standardized		
(Constant)	-.217		-2.027	.043
Remuneration System X <sub>1</sub>	.534	.454	12.054	.000
Remuneration Structure X <sub>2</sub>	.230	.199	4.421	.000
Welfare Policy X <sub>3</sub>	.209	.213	5.802	.000
Intrinsic Motivation X <sub>4</sub>	.135	.138	3.754	.000

a Dependent Variable: Remuneration Fairness

b \*P<0.05

We obtained regression equation( $Y_1 = -0.217 + 0.534X_1 + 0.230X_2 + 0.209X_3 + 0.135X_4$ ) according to Table 3, the results suggested that, as expected, the independent variables(i.e. remuneration system, remuneration structure, welfare policy and intrinsic motivation) had a positive impact on remuneration fairness, which provides support for H1, H2, H3 and H4. Such analysis had been enough to answer the relationship between remuneration of diagnostic elements and proved that the remuneration fairness can be a intermediary factor. So we directly do the regression analysis between remuneration fairness and initiative separation instead of diagnostic elements and initiative separation by following the view.

Same as the above steps, Table 4 suggested that the Durbin-Watson statistic is 1.754 and the model could explain 32.9 percent of the variation in remuneration level, as tells us the initiative demission variables can explain the remuneration fairness.

**Table 4 Model Summary<sup>b</sup>**

Model	R	R2	Adjusted R2	F Change	Sig.F Change	Durbin-Watson
2	.575a	0.33	0.329	185.986	0	1.754

a. Predictors:(Constant),Remuneration Fairness

b. Dependent Variable: Initiative Demission

**Table 5 Coefficients<sup>b</sup>**

Model	Coefficients		t	Sig.
	Unstandardized	Standardized		
(Constant)	5.108		38.631	.000
Remuneration Fairness X <sub>1</sub>	-.504	-.575	-13.638	.000

a Dependent Variable: Initiative Demission

b \*P<0.05

According to the results showed in Table 5, we get the regression equation  $Y_2 = 5.108 - 0.504X_1$ , which suggested the initiative demission had a significant negative impact on remuneration attitude, so the H5 had been proved.

## 4 Conclusions

This study analyzed the impact of the OEM enterprise remuneration satisfaction factors, verified that pay fairness playing a role as an intermediary factor between remuneration satisfaction factors and risk behaviour (i.e. initiative separation), and explored the impact on the different types of remuneration satisfaction factors for employees' demission behaviours.

The results can be shown as follows. According to literature summary and fieldwork, we divided the remuneration satisfaction factors of OEM enterprise into five elements (remuneration system, remuneration structure, welfare policy, intrinsic motivation and remuneration fairness), actually the five

factors has intricate internal relationship. The data shows the first four factors having a significant positive relationship on remuneration fairness, in which the remuneration system has the greatest influence, followed by the remuneration structure, which means the remuneration fairness can be used as a intermediary factor to analysis the influence of pay satisfaction upon initiative separation. And we also find remuneration fairness has significant negative correlation to initiative demission that illuminates the higher of the remuneration satisfaction, the lower probability of a demission initiated. Consequently, during practical working manager can elevate the remuneration satisfaction primarily by modifying remuneration system and improving welfare policies. In view of the fact that most of the OEM enterprises are for high-tech processing, the organizations pay more attention to the skills of the ordinary technical staff, for this reason, by taking the short-term incentive system (i.e. skill wage) enable employees to an objective assessment of salary level for higher pay fairness. Nevertheless, the manager can take incentive stock options for the core staff, in order to making their own interests and business interests to a greater extent consistent, thereby increasing employee loyalty and reducing the demission probability. Furthermore, through scientific and standardized practices survey, the company can develop a remuneration structure for all types of employee needs, which not only play a incentive role, tap the potential of the staff, and improve working, but also effectively avoid pay-risk behaviour occurring.

However, there are still a few limitations in this paper. First of all, our sample is not big enough, future research can increase the sample size, which will reflect more general problem. Second, we only select five factors that affecting pay satisfaction, whether there are other factors that can be included in future research.

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# The Research on Company's Investment: An Empirical Study of Marks & Spencer

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**Abstract:** Marks & Spencer, as one of the UK's leading retailers, sells high quality, great value clothing and home products as well as outstanding quality food. For a corporate marketing strategy of setting up overseas retail operations in Japan, Japanese whole economic environment should be carefully examined, which may reveal any underlying risks and potential benefits. Based on the case of Marks & Spencer, we analyze the feasibility of company's investment. Finally the calculation has given out the cash flow, income statement, NPV and sensitivity analysis.

**Keywords:** Investment; Risks; Financial; Marks & Spencer

## 1 Introduction

Marks & Spencer as one of the UK's leading retailers, sells high quality, great value clothing and home products as well as outstanding quality food. It expanded all across the UK, Europe, the Middle East and Asia. Being international would largely decrease the risk of bearing the domestic economic cycle and make brand more valuable. Investment has increased its importance within a company's growth. Oversea investing tends to take more time and attention of a corporate on looking and planning before making any commitments. For a corporate marketing strategy of setting up overseas retail operations in Japan, Japanese whole economic environment should be carefully examined, which may reveal any underlying risks and potential benefits.

Japan is a highly developed country, with high standard of living, per capita GDP over \$30,000. Japan was already a mature, developed economy. It is one of the world's richest countries, owning highest living standards and mostly developed economy. Japanese domestic market is lucrative, with great tertiary industry, high-technical improvement trade and world leading manufacturing industry. Japanese are considered as the target population of high purchasing power and the willingness to pay for high standard quality life. Also, being as the leading country with high economy level and large population, Japan translates it into a huge consumer market. Fitting with the principle of M&S selling high-standard goods and organic food, Japanese tends to high-spending and specialty shopping, which offers a good foundation for M&S's development.

Japan describes itself as "plays an important role as a bridge nation connecting Asia and the world, which contributes to Asia's growth." It owns great reputation among western and Asian companies, with 45% surveyed candidates admitting 'very attractive or attractive' for living environment suitable for foreigners, and 39% felt comfortable of its well-developed laws such as intellectual property rights. Japanese government offers series of favorable policy to improve its investment climate and attract more foreign capital. Tokyo, which concentrated large proportion of the population, sets low capitalization rate lower than many other cities, in order to attract more investment.

However, year 2011 has been a tough year for Japan and the global economics. The violent earthquake in northeastern Japan and triggered tsunami caused massive death and homelessness but also gave a strong shock to Japanese economy and even of the whole world. Being as the world leading industrial and export power country, the strong earthquake in Japan has necessarily taken a visible impact in the world economy. However, the government has allocated about 21 trillion yen in stimulus since the earthquake, showing an optimistic view of taking aggressive actions to compensate possible financial panic. According to the new reported by Bloomberg in March 1, the capital spending of Japan excluding software has rose 4.9 percent compared to a year earlier, reaching almost five years peak, when it was just one year the Japanese recovered from the disaster. Government has been doing many stimulus actions in order to boost confidence in the Japan economic outlook. But the nuclear leakage problem has always being a potential hazard among local residents and investors, once nuclear leakage influence were expanded, it would be an irreversible undeniably and destructive disaster.

Look across the whole environment and cultural context in Japan, there exist many differences manifested in many aspects including history, culture, customs and relationships, values and aesthetic standards. It had been reported and discussed in the earlier years that the direct investment in Japan has

been slow down due to many economic cultural barriers. One of the most elusive obstacles seen by foreign investors is the cultural barriers. Although the government has offer many easing policy to attract foreign investment, these measures also become victims of abuse in typical Japanese, due to the bureaucratic interference. Meanwhile, many social phenomenon has also deterred foreign investment, such as high living cost, lack of regulation transparency, strict immigration rules and national lack of English skills. It is considered by foreign investors that the Japanese government tax system and financial regulation is in the red tape, which is also a barrier for making strategic planning of foreign investment.

This paper is organized as follows. Section 2 presents the Potential Foreign Exchange risks and their management. Section 3 gives out the organizational Structure. Section 4 mainly talked about the financial appraisal. Section 5 presents the decisions and in section 6 we draw some conclusions.

## **2 Potential Foreign Exchange Risks and Their Management**

Being as an international company with incomes in more than one country, foreign exchange rate could largely influence the profits.

The simple and direct understanding of foreign exchange risk could be exchange rate and the interest rate risk, which involves the elements fluctuated and really hard to predict. There are various factors may influence the exchange rate, such as international payments, foreign exchange reserves, international capital flows, inflation, political situation. However, the foreign exchange rates not simply included the exchange rate and the interest rate risk, but also performance in transaction risk, translation risk and economic risk. The key factor involved in exchange rate is the domestic currency, foreign currency and the timing. While the accurate proportion of currency depreciation or appreciation is inestimable, timing is the most important factor for investors. The use of financial derivatives to avoid exchange rate risks has become an inevitable choice.

The most common and direct way of hedging the exchange risk is the wise use of future and forwards contracts, offsetting foreign currency holdings or expected revenue. The forward contract can be explained as a transferring of risk to another business by transaction at a pre-agreed rate. Expected currency rate and the expected time value should be carefully examined. This method has advantage on preventing the cost of foreign exchange risk within a certain range; in addition, it is beneficial for cost accounting as it transfer the uncertain exchange rate into calculated element. This method could reach two kinds of currency risk write-off in the provision of time, eliminating time risk and value risk.

There are also various hedging tools of financial derivatives, such as future contract and option. Compared to the forward contract, option method has more function of preservation, as it has to be transacted in the agreed exchange rate in the agreed time when fulfilling the forward contract, which might not protect the future value. Investor may default or execute an option contract according to the market exchange rate, with the worst loss of a premium only.

As our project of investing in Japan for a payback period of about 5 to 6 years, which is relatively a medium long term investment, hedging method suitable for long-term investment should be selected. Thus forward contract, future contract and option should be combined and composed as an optimizing scheme to hedging against the exchange risk.

## **3 Organizational Structure**

Now that the directors of M&S want to extend its operating area and hope to open up new market abroad. Finally, they choose Japan and desire to open about 50 shops in two years. In order to make it be profitable, the company in Japan should have a good organization structure. Thus it can operate successfully.

Usually, there are two kinds of organization structure for a company to choose, that is subsidiary and branch. According to some materials, the author finds that many companies are more likely to operate as branches in abroad countries that have higher taxes and lower regulatory restrictions on industry entry and on foreign branches. On the contrary, subsidiary operations are preferred by companies, which decide to seek to penetrate host markets by establishing large retail operations. In addition, economic and political risks have opposite effects, that suggest legal differences in parent companies' responsibilities associated with branches and subsidiaries are quite significant determinants of multinational companies' organizational form.

Based on the conditions of M&S, it can be concluded that the company is the first time to open up markets in Japan, tries to transplant its business philosophy so that it can maximize its market share and

corporate value. Thus, it can be found that subsidiary should be the most ideal organizational structure. Subsidiary form has many characters, for example, transfer prices, management charges and artificial financing structures are out of local control. More importantly, subsidiaries' operation right is independent from the parent company and cannot take over the parent company. Moreover, combined with Japanese taxation system, M&S will surely enjoy tax policies and effectively avoid the corporate income tax, which can bring a great deal of profit. Due to the fluctuation of currency, high risk can exist. But subsidiary form can help M&S reduce this risk in finance. But in the way, there is need for flexibility of repayment from the parent company and quantity of support, including human resources and technology.

As it is known, M&S has three main parts of business, namely clothing & home, food and stores. Owing to the irrelevant character, three parts may operate separately in every subsidiary. So it is very vital to take the method of business unit. Why this? There are many advantages of business unit:

(1) Business unit can help to develop the human resources' potentials and it is conducive to the culture of the company's reserve team. More importantly, the division system can make the top leaderships to get rid of the daily administrative affairs. Thus the leader team can become stronger and spare more time focusing on strategy and market, which lead to better development of the company.

(2) It can be in favor of performance management. Division as a profit center, business unit can not only facilitate the establishment of the standard measure of employees' working efficiency, but also make it easy to evaluate the contribution of each product on the company's total profit.

(3) It will be beneficial to the specialization and the formation of economies of scale. Each business unit can operate the entire process of production of its own products or services to facilitate the organization of specialized production. By forming economies of scale, using special equipment, and making personal technology, the company can have high labor productivity and economic efficiency. Thus it can help to improve local tax and do a great deal to enhance the revenue of the Financial.

In conclusion, analysis above has given to much evidence to prove it is feasible to build subsidiaries in Japan. Despite of this, it still needs market to detect whether this kind of organizational structure is economic or not. Gradually, M&S will establish more mature structure and become successful in Japan.

#### 4 Financial Appraisal

But any investment is fraught with risks as well as opportunity.

Based on the conditions given in the material, the calculation can be demonstrated as follows:

Step1:

According to the historical numbers and tendency chart, inflation forecasts in UK and Japan can be forecast based on individual risk preferences and awareness. They are donated to calculating exchange rate, for

$$\frac{S_t}{S_{t-1}} = \frac{P_t^* / P_{t-1}^*}{P_t / P_{t-1}}$$

(where t= time period, St=spot rate in foreign/domestic currency, Pt=price level in period t, \*represents foreign values).

Step2:

Usually, the CAPM model is used to get the cost of equity, which is finally equal to 8.56%, and all can be collected with some assumption. Then, it can easily obtained that the cost of debt is 5.57%.

Step3:

It is estimated that each shop will cost approximately 1bn yen to set up, and that they would open 50 shops over the course of two years (spread evenly over that time). What's more, each shop opening cost includes two parts:(1) fixtures and fittings of 300m yen, which is allowable for tax on a straight-line basis of 20% per annum,(2) a 5-year lease of 700m yen. This means that all of the cash is payable up front and no ongoing rental cost is payable for the M&S 5 years. Based on this, the cost of fixtures and fittings and lease can be marked. Because these numbers are taking a different approach, so they can be quite different in cash flow and income statement annually. That's why the cash flow of fixtures and fittings in 2011 is 7500 and lease is 35000. However in income statement the cost of fixtures and fittings in 2011 is 1500 and lease is 3500.

Because market research costing £1m has indicated that in the first year, which demands each shop expects sales of 1.2bn yen. Then based on the information that each shop sales will grow at 25% in the

second year and 10% per annum there after (including the effect of inflation), selling revenue of different year can be gotten, by using  $1200 \times 25 = 30000$  in 2012 and  $1200 \times 50 \times (1 + 25\%)$  and so on.

Gross profit margins are expected to be 35% based on current prices and exchange rates. 50% of goods will be sourced in the Japan, and the remaining 50% will be supplied from the UK via M&S head office. Owing to this information, the cost of goods from Japan and UK can be calculated separately. Because all this cash should be measured in yen, the result of exchange rate should be used to get the results of cost of goods from UK, which is quite complicate.

Local operating costs of 150m yen per annum per shop will be incurred. These costs are expected to move in line with local inflation. In addition, monitoring and management costs of £5m per annum to cover all shops will also be incurred in the UK in relation to this venture. Any excess funds from the Japanese stores will be returned to the UK at the end of the year. All the information given in this part is extremely useful for the calculation of operation cost and WDA. The calculation procedure of this part can be seen in Excel book.

Step4:

After all the revenue and cost is figured out, something about corporate tax rate is important so that the corporate taxation can be gotten.

Step5:

NPV method assumes that each cash inflow received is reinvested at the required rate of return, whereas the IRR method assumes that each cash inflow received is reinvested at the computed IRR. NPV and IRR can be finally calculated with the numbers in cash flow. Then, whether the project will be adopted can be concluded.

Step6:

In order to do sensitivity analysis, key influencing factors should be founded out. It is easy to know that exchange rate and WACC are the two key factors. Exchange rate change has a great effect on the cost of good purchased from UK. So as to the first factor- exchange rate, 10% floats up and down. Thus it can get new NPV. If the NPV value is quite different from the initial, it means that the directors of M&S should pay enough attention to this. The whole profit can be affected with the fluctuation of exchange rate. As regards for WACC, WACC change limits the proportion of equity. 10% is added or subtracted to the initial value. NPV is also calculated in different conditions.

## 5 Decision

Referring to the data from the result of the calculation, on recent condition, the value of NPV is 294.98. It is common sense that in general if the value of NPV in a project is bigger than zero, then most investors will consider to carry out this project, which means the project is good enough and can bring extra profit for the investors, and vice versa. The second indicator is IRR. The value of IRR in this project is 27%. People often use this value to compare with WACC. They have expect for return on the investment. If IRR is larger than WACC, the project will be adopted, and vice versa. NPV has positive value and IRR is much bigger than WACC, so the board of directors needs to vote in favor of this project. They may take action right now for unpredictable changes in markets.

However, everything has to two sides. The hidden and potential risk must be considered. Based on the final outcome of sensitivity analysis, 10% decline in exchange rate leads to huge reflect of NPV. So something about the financial market and Japan politics should be paid much attention to. If there is large fluctuation in exchange rate, the profit can be diluted. What's worse, loss will be brought. How to solve this problem? M&S may set up an information department, whose duty is to collect market information as fast as possible and to build warning system. By this way, the company is rapid to prevent the worst thing happening. Or it can hire an information company locally, which can help them to do the work and hand in report weekly. And public relations department also plays an vital role. The workers in this department may devote them to establishing good relationship with local government and often communicate. What's more, if something serious happens, they should reflect as rapid as possible to leave a good impression on the public and make the company have good image.

Then what about WACC? Too high or too low are both not good to a company. So the CFO in M&S may try to use his/her competence to finance appropriate and take optimal portfolio. Appropriate quantity of asset and debt is hard to decide. This can be reached by referring to the historic number of M&S.

## 6 Conclusions

Above all, M&S can implement this project. While doing this business in Japan, in general, it should focus on the competitive action and employee turnover. Then the management of this company should pay much attention to the exchange rate and make proper financing

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## Needs Analysis and Innovation of ESP Teaching

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**Abstract:** Traditional EGP teaching is being gradually replaced by ESP teaching since the society and employers have a higher expectation of college graduates. By means of theoretical discussion and experimental research, this paper puts forth specific suggestions as to how to innovate ESP teaching in China. Only if ESP course features are paid attention to by both syllabus designer and the teacher of Specialized English reading course, can it be improved. Therefore needs analysis plays an extremely important role in the design of an ESP course, and the innovation of present ESP teaching should be based on needs analysis.

**Key Words:** Needs analysis; ESP; English teaching; Innovation

### 1 Introduction

In China, nearly all universities and colleges provide College English course to their students. College English focuses itself on the basis of language, such as pronunciation, vocabulary, grammar and notional, functional expressions. Students learn English for general purpose and the learning materials for them also cover a wide range based on the basis of the language. So college English is actually what we called EGP (English for General Purpose).

From the early 1960s, English for Specific Purposes has become one of the most prominent areas in EFL teaching. "It is an approach to language teaching in which all decisions as to content and method are based on the learner's reason for learning." (Tom Hutchinson and Alan Waters: 1987). In an ESP course, learners are trained to use language in certain context; teachers are concerned with designing appropriate courses for various groups of learners.

General English is the topic often discussed, but ESP is the one we are not so familiar with. Some people described ESP simply as teaching English for any purpose that could be specified. Others, however, were more precise, describing it as teaching English in academic studies or teaching English for vocational or professional purposes. ESP should be viewed simply as an "approach" to teaching, what Dudley Evans described as an "attitude of mind".

In China, the ESP movement has shown a slow but definite growth over the past two decades. In particular, increased interest has been spurred as a result of social needs after China has become a member of the WTO. This has led to a rapid growth in English courses aimed at specific disciplines, e.g. English for Chemistry, computer, business, engineering, medicine, civil aviation, finance and so on, in place of the more traditional General English courses. According to the new college English syllabus, juniors or seniors should study ESP or subject-based English (SBE) after they have passed CET-4 or CET-6. Universities and colleges should provide different ESP courses to ESP learners according to their majors. Sadly, only some key universities have lived up to this requirement. Worse still, the line between where General English courses stop and ESP courses start is very vague indeed. Few teachers have ever thought of conducting a needs analysis to find out what was necessary for students, to our comfort, some universities and teachers are paying attention to this problem. Undoubtedly, it is time to innovate ESP teaching to meet the needs of English learners and the society.

### 2 Significance of Needs Analysis

A needs assessment enables researchers to justify their assumptions whether or not potential educational needs are sound, to design a program in terms of topics, materials so as to be responsive to the needs of participants. This can maximize the likelihood of students' participation. Finally such focus on satisfying learner needs will help the learners to concentrate on learning and applying what they have learned. Richard believes that the data to be collected from learners, teachers, administrators, and employers in the planning process will help to identify general and specific language needs and contents of a language program. Besides, it will provide data for review and evaluation of the existing program. Then why should we conduct needs analysis?

First, needs analysis tells an ESP course from an EGP course. Generally speaking, needs analysis aims at answering such questions as who will learn the language and why, where, when the language is learned. These questions may fall into two categories: target needs and learning needs. As for target

needs in specific, it explains what the learner needs to do in the target situation. Obviously, target situation for a business man and for a technical worker determines different language contexts they are going to learn. Only if the ESP teacher understands full well what the learner is going to do in a target situation, can he choose proper learning materials and teaching methodology. Whereas for the EGP learner, he does not have any specific purpose in learning a foreign language. On the other hand, English for junior and senior students are specialized. Students' future professions require that they should acquire not only terms but also the ability of how to use them in different situations. Therefore, it is obvious that analysing target needs has not been made full use of in syllabus designing and material choosing at this stage.

Second, needs analysis contributes to the design of a reasonable syllabus and the choice of effective methodology in ESP course. In analysing target needs, necessities, lacks and wants are three important distinctions. Necessities are what the learner has to know in order to function effectively in the target situation. A good understanding of the learner's demands is helpful in deciding on what is going to be taught. Besides, analysing lacks is important in course design, too. It is easier to see that learning time, learning material and teaching methodology would vary for intermediate learners and advanced ones. In fact, it is lacks that determines the variation. Lacks refers to the gap between the target proficiency expected of learners and the existing proficiency. How large the gap is would decide the learning material and the time for learners to gain the target proficiency. Furthermore, if time is fixed, the gap would determine what methodology is going to be applied in the learning process. Only proper methodology will bring about effective learning. When the idea of lacks is applied to Special English reading course, the teaching method is to be questioned. For one thing, time of learning at this stage is fixed. For another, neither is the course a translation one nor is translation method an effective way of teaching in today's classroom. The reason why the translation method is the dominant one is that the teachers care little about the lacks.

Thirdly, needs analysis helps identify and, thus, plays a very important role in arousing the learner's motivation. The learning process of an ESP course not only involves the ESP teachers' workload, but also has much to do with the views of ESP learners to the course. Wants is found in the conflict views towards needs between course designers and sponsors and learners. The greater the conflict is, the more disappointed the learner feels of the course. Then, he lacks the motivation to learn. There are conflict views towards needs between the Syllabus and students in Specialized English reading course, too. The Syllabus regards that students need to read original works in their field while students believe that their future professions need not only reading skill but speaking, listening and writing ones. So, most students are not satisfied with the present course. Therefore, it is not strange that students have little motivation to learn. Furthermore, a better understanding of learning needs contributes to invoking the learner's motivation, too. An analysis of learning needs is trying to answer the question of what the learner needs to do in order to learn. In other words, it is how the learner is going to get from starting point to the destination. Though the ESP learner may just as well have strong motivation in reading long and dull material in target situation, but it is not the case in classroom. So, in the process from starting point to the destination, it is vital to keep the learner being interested in learning. Bearing the learner's motivation in mind, an ESP teacher would probably adjust his teaching techniques constantly. This is a challenge to present ESP teachers' translation method and also a challenge to the traditional way of choosing specialized English reading course teachers. It is said that the inner factor is the key point. So long as the motivation of students is aroused, can they acquire a good command of English. Needs analysis is still critical in accomplishing it.

In order to help students obtain the abilities needed in their work and to improve our teaching efficiency, this research tends to search a better way for ESP teaching, which includes arranging courses, choosing teaching materials, adjusting the teaching methodologies according to the students' needs.

### **3 Experimental Research and Findings**

If we analyse the students' needs and try to live up to their needs, will they make better academic achievements? The writer conducted an experiment on two classes of the same level from September, 2010 to March, 2011. Class A is the treatment group and class B is the controlled group. In the research, the software SPSS is used in comparing the test results of class A and class B. The writer uses SPSS to do relevance analysis of the students' examination scores. See table 1:

**Table 1 Compared Result**

	N	Correlation	Sig
Class A_ Class B	20	1.000	0.417

According to table 1, the correlation of the scores of the students in class A and class B is 1.000. From the statistic point of view, the correlation 1.000 means that the students from the two classes are of the same level. Having proved that the students of class A and class B are of the same level before the experiment, if their examination scores have a great difference after the experiment, we can conclude that it is the result from the different teaching methodologies.

For class B, the teacher took the routine approach: First, translate the terminologies of certain subjects from Chinese to English; Second, explain the contents of the text; Third, assign some translation exercises as after-class practice.

While the students in class A were asked to write down their needs-what they wanted to learn from the course at the beginning of the term. Then the teacher chose the teaching materials and arranged the processes of the lesson according to their needs. Every student felt like a protagonist, so everyone was actively involved in class instead of sitting idly to wait for the teacher’s explanations.

After one term, the mean of class A raises 3.20, improves from 73.35 to 76.55, while the mean of class B only raises 1.1, improves from 73.2 to 74.3.

**Table 2 Paired Samples Test**

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
A_NEW-B_NEW	2.6800	10.2740	2.2772	1.164	19	0.248

From table 2, we can see the sig is 0.248<0.5, which proves that the difference between the two classes is meaningful. So we can draw the conclusion that the students in class A make greater progress than the students in class B.

In the experiment, the students of class A, who undergo needs analysis, make greater progress than those in class B in ESP course. From the comparison between class A and B before and after the experiment, we can have the following findings:

1) We should innovate the teaching materials and syllabus. Teachers should choose suitable materials according to the students’ needs and appropriate syllabus should be designed based on a needs analysis.

Without appropriate materials, it is hard for teachers to instruct students for their study. Material writing is one of the most characteristic features of ESP in practice. In marked contrast to general English teaching, a large amount of the ESP teacher’s time may well be taken up in writing materials.

Materials for students of class B include a Chinese-English dictionary and some extracts from foreign textbooks. The students say that they only read a few of the extracts because the articles are not related with their major and they are not what they want to learn. Furthermore, some passages are too easy for them since the contents of the passages are something they have already learned in the middle school; while others are extremely difficult both for the English language points and the content. The materials for class A are chosen from some foreign textbooks and scientific journals. All of the articles chosen are about advanced specific knowledge in the students’ major field. Before class, the teachers put notes after each section to help the students to digest better. The notes that include both the difficult language points and some profound specific knowledge, combine the work of both English and professional teachers. For the language points, the teachers would underline the difficult parts and explain the grammatical phenomena of the phrases and usage of the words. These save the students’ time in consulting dictionaries. For the specific knowledge, the teachers will explain the difficult points in Chinese in the notes. Thus, it can first make sure that the students understand the principles in the specific field, and afterwards, they can refer back to the article written in English and learn the corresponding expressions in English. In class, the students are required to discuss what they have read from the material in English. In this way, the students can know more about the specific knowledge in their major fields, at the same time, they can improve their abilities in communicating in English.

Here the writer expects that the authorities concerned would attach importance to the difference between ESP and EGP and design appropriate syllabus based on a needs analysis. In light of the difference between ESP and EGP, we should treat them differently and adopt different materials and



syllabus to meet the needs of the students.

2) We should innovate the teaching methods in ESP teaching. Teachers should take flexible teaching methods in ESP teaching.

It is a misunderstanding that teaching means that the teacher talks and the students listen. Learners may well have a clear idea of the necessities of learning. A need does not exist independently of a person. It is people who build their images of their needs on the basis of data relating to themselves and their environment. Bearing in mind the importance of learner motivation in the learning process, the teacher cannot ignore the learners' perceived wants.

According to the needs analysis, the postgraduate students want to discuss with their classmates and teachers to tackle problems in reading. For class B, the teacher still use grammar-translation approach. Though it can meet the needs for basic language usage training, it is far from enough in cultivating the students' interests and competence in using the language. On the contrary, it just makes the students feel bored and lacks enthusiasm in learning. For class A, the teacher tried to seek a balance between input and output. The students were all given ESP courses based on texts from their subjects, for example, articles introducing medicine for medication majors; articles about latest robot design for students in mechanical engineering. This would motivate the students because of the apparent relevance to their studies. The students learn something new through reading before class, which is the input prepared for the later output-discussion. In class, the students discuss what they knew from the reading material. They can straighten out their thoughts, realize their own faults and solve the problems during the discussion. Input is the prerequisite for the language acquisition and knowledge acquiring, but it cannot be fulfilled without the output checking.

In this information age, no one can survive without exchanging information with the outside world. The students want to improve their abilities in communicating with foreigners as well as gaining the advanced knowledge from books and papers written in English. The "reading and discussion" method serves this need. From the reading part, students can learn how to find out the main idea, how to search the needed information more quickly and also the corresponding expressions in Chinese and English; from the discussion, students can learn to express their thoughts with the terminologies in their field.

3) Knowing the students' needs, teachers can trigger the students' motivation in ESP learning.

In needs analysis, we stress that it is an awareness of the needs that characterizes the ESP situation. But awareness is a matter of perception, and perception may vary according to one's standpoint. When communicating with foreigners, it cannot be avoided to involve in manners from different cultures. The teacher of class A has prepared some text-related cultural background knowledge and discusses it with the students in class, which triggers the students' interests in further study. Besides, the teacher in class A also arrange sometime for each lesson to answer questions, which helps the students to solve their puzzles when they cannot find answers elsewhere. After one term, the students in class A are obviously more familiar with the terminologies in their fields and more fluent in using English to express their thoughts, and what's more important, they begin to like learning English.

## 4 Conclusion

According to the theoretical discussion and case study and its findings, it can be inferred that needs analysis plays an extremely important role in the design of an ESP course. By analysing the test result of class A and class B with the SPSS, we find that needs analysis is extremely important for ESP teaching and learning. A ESP course would be a successful one if great importance is attached to needs analysis. It is helpful in the innovation of specialized English reading course as it not only affects syllabus design, materials writing, classroom teaching, but also helps ESP teachers bear in mind the learner, a decisive factor in learning. Only if ESP course features are paid attention to by both syllabus designer and the teacher of Specialized English reading course, can it be improved. Doing a needs analysis can make it clear that how language learning and skills learning can be maximized for a given learner group and help us design an effective syllabus.

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# Research on the Impact of Pay Fairness on Pay Satisfaction in OEM Companies

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**Abstract:** We made the staff in Original Equipment Manufacturer (OEM) as the object of study, and discussed how pay fairness affects pay satisfaction. After dividing pay fairness into the comparative sense of fairness and the institutional sense of fairness and satisfaction into the welfare satisfaction, pay structure satisfaction and pay level satisfaction, by using SEM we find the correlation between each dimension, which may help OEM companies take more effective measures to enhance employees' pay satisfaction and increase their enthusiasm for work.

**Keywords:** OEM companies; Pay fairness; Pay satisfaction; SEM

## 1 Introduction

Pay satisfaction is the attitude of employees to salary, which was firstly raised by the American scholar Adams in 1956 that meant the feeling of personal remuneration fairness. Followed by other scholars also raised the related definitions, Miceli and Lane said it was the sum of positive or negative emotions from individual salary, and Lawler considered it as the differences of staff's expected income and actual income. This perception was based on pay fairness that had a major impact on staff motivation and job performance. Raising pay satisfaction comes to be an important part of human resources management in modern enterprise.

With the transferring of global manufacturing center, a growing number of international enterprises put their emphasis on China which leads the tag "Made in China" an outstanding place in global manufacture industry. As is at the end of the value chain, most of the profits of the product obtained in the course of design and brand management, while the profits left to OEM companies is very limited. In order to survive in the fierce competition, OEM companies have to damage the interests of employees to improve their profits, which resulted rising the unfairness and decreasing the pay satisfaction, which makes many problems prominent. Studying the relationship of pay satisfaction and fairness may help to a better understanding of the salary's formation, as is made to take more effective.

## 2 Pay Satisfaction and Pay Fairness

Equity theory and differences theory are two theoretical basis of pay satisfaction, at the beginning of the pay satisfaction research, equity theory has been applied. A study found that the sense of fairness to general employees' pay satisfaction was much stronger than expectations (Klein, 1973). And staff determines a fair understanding of employees' pay satisfaction (Heneman, 1985), so in order to achieve fair we have to deal with the relations of inputs and outputs. Actually, there was a significant relationship between distributive fairness and pay satisfaction (Oldham, 1986). Followed by Sweeney (1990), Summer and DeNisi (1990), and many other scholars also obtained the same results. Then study found that employees' feelings of fairness on the organization's system management and method would affect their job satisfaction (Lee, 1995). And the program of organization in the pay fairness reflected how the organization allocating resources, and which had relation with the evaluation of pay system (Martin, Belmet, 1996). Only by establishing on an equitable basis can the pay system be the most effective role to motivate staff. In China, researcher found that the pay fairness in organization (i.e. results, programs, interaction and information fairness) is an important factor to various types of pay satisfaction (i.e. pay levels, bonuses, benefits, raises, pay systems and management satisfaction) factor (Wu Xiaoyi, 2006).

After sorting out the literature, we find that most scholars at home and abroad have recognized the sense of fairness had a significant influence on pay satisfaction, and nail down the theoretical value and practical significance of equity theory using in pay satisfaction research. At the same time, there was also a part of foreign scholars studying the affection from the equity theory to various elements of remuneration with cases. However, the research based on the pay fairness and satisfaction in OEM companies is rarely, especially there is almost no empirical research in this area within our native scholars. After combining the researches of other scholars and investigation of the OEM business

practices, we set the pay satisfaction into three dimensions -pay level, pay structure, welfare satisfaction, and divide pay fairness into comparison fairness and system fairness. Finally we test the interaction of these factors.

### 3 Course of the Study

#### 3.1 Indicators design

(1) Pay Satisfaction: Employees' pay satisfaction not only presents the intuitive pay level satisfaction, but also the welfare and the pay structure. Herbert.G. Heneman and Donald.P. Sehwab had divided pay Satisfaction into pay levels, benefits, salary promotion and salary structure / management satisfaction (Herbert.G. Heneman and Donald.P. Sehwab, 1978).Wang Wei made pay satisfaction into pay level satisfaction, pay structure satisfaction, pay system satisfaction and the level of benefits satisfaction (Wang Wei, 2004).Therefore, in this article, we will divide pay satisfaction into three dimensions-the pay level satisfaction, pay structure satisfaction and welfare satisfaction. Remuneration level satisfaction reflects the employees generally pay satisfaction, as well as key staff's pay satisfaction; Salary structure satisfaction reflects the incentive pay satisfaction and satisfaction for the calculation of the salary structure; Welfare satisfaction reflects the satisfaction of the overall level and affection of intrinsic motivation.

(2) Pay Fairness: Employees are very concerned about the fairness of the salary, they not only pay attention to the pay distribution fairness (Folger,and Greenberg, 1985), such as the fairness of the external remuneration and the internal remuneration(Kuang Suxun,2002), but also the fairness of designing and implementing of the pay system(Wang Yue, and Zhou Changqun,2002).Therefore, we divided the pay fairness item into two dimensions-pay comparison fairness and pay system fairness. The pay comparison fairness means the inherent fair feelings of whether the employees individual pay levels reach to their expectations, and the external fair feelings of the comparison with others. While, pay system fairness mainly reflects the fairness of pay system development and implementation.

(3) Questionnaire Design: The questionnaire uses the Likert five-point scale, so that the subjects can use 5 levels—strongly agree, agree, not sure disagree, strongly disagree to measuring the feelings, and respectively correspond to endow with a value—5 points, 4 points, 3 points, 2 points, 1 point, the option “1” represents “strongly disagree”, “5” represents “strongly agree” to arrive at each satisfaction factor of the actual experience score.

#### 3.2 Sample and data collection

The object of this investigation is the foreign OEM enterprise, We totally issued 500 questionnaires, and actually received 432 ones, representing a satisfactory effective response rate of 86.4 percent, excepting for incomplete and significantly biased questionnaire, the final number is 379.In order to avoid each other discussing from affecting the accuracy of the questionnaire, we conducted a separate survey for different staff to ensure employees do not have any communication, which was made to ensure the authenticity of the questionnaire.

### 4 Model Modifying and Result

#### 4.1 Reliability

Reliability refers to the reliability of measurement data, measuring the stability and consistency. In general, if the Cronbach coefficient is about 0.90 that means the reliability of the test or scale is “excellent”, about 0.80 can be considered “very good”, and about 0.70 can be considered “adequate”, about 0.60 is acceptable to a reasonable extent (Peterson, 1994; Slater, 1995).After analyzing with Spss17.0,we find the Cronbach' s value of each scale shows a reliable coefficient ,which indicates the consistency of the scale of measurement results is very good (Pay level satisfaction=0.692; Welfare satisfaction=0.936; Pay comparison fairness=0.952; Pay system fairness=0.921;The whole=0.976).

#### 4.2 The measurement models

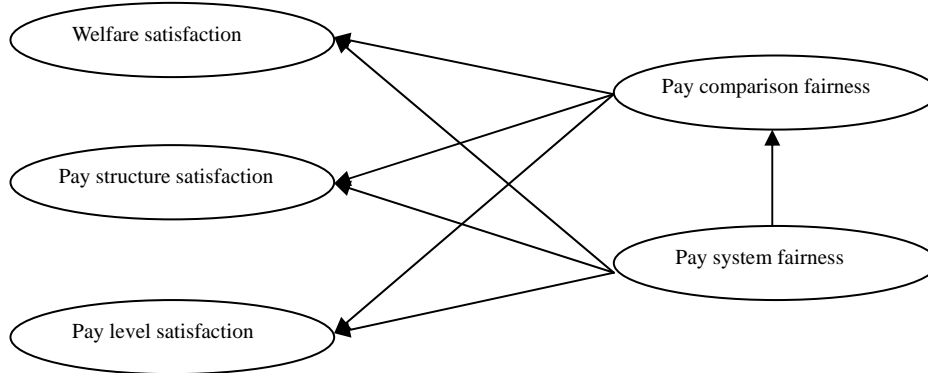
We have a total of five measurements models in this study, and confirmatory factor analysis should be made to ensure the indicators reflect various factors before we make the whole model testing. By using Amos17.0 software analysis, we get the following results:

The results show that the CFI, TLI values in the theoretical model of this study are greater than 0.85, while the RMSEA value is less than 0.1, which means the relationship between the factors and indicators pass data validation, indicating that the indicators can be better reflect the factor information and the model can be further tested.

**Table 1 Measurement Models**

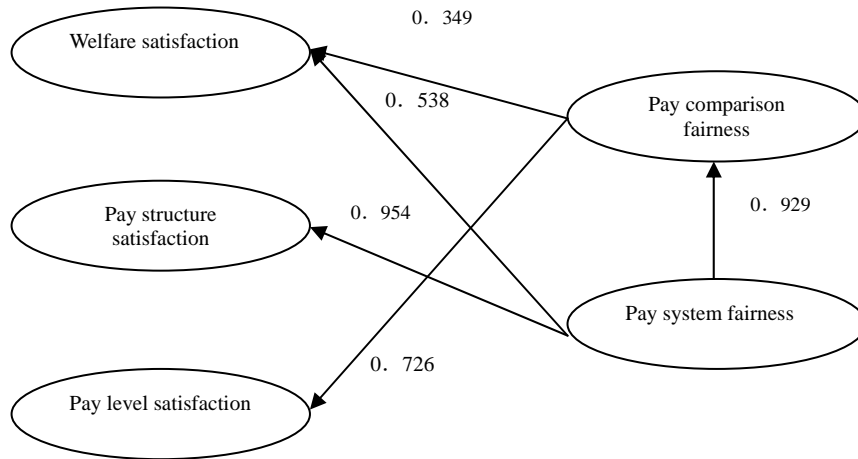
Models	$\chi^2$	DF	CFI	TLI	RMSEA
Pay level satisfaction	37.444	8	0.942	0.892	0.099
Pay structure satisfaction	123.820	53	0.961	0.951	0.059
Welfare satisfaction	394.344	103	0.926	0.913	0.087
Pay comparison fairness	177.553	76	0.961	0.973	0.059
Pay system fairness	329.765	103	0.922	0.909	0.076

**4.3 Model Modifying and Hypothesis Testing**



**Figure 1 Completed Model**

Based on the five measurement model, we use Amos17.0 to establish the structural equation model (See Figure 1), the saturated model show:  $\chi^2=98.00$ ,  $DF=28$ ,  $CFI=0.975$ ,  $TLI=0.959$ ,  $RMSEA=0.081$ , the result is not good, and path coefficient between the “Pay comparison fairness” to “Pay structure satisfaction” and “Pay system fairness” to “Pay level satisfaction” are not significant, so we removed the bad path to amend the model (See Figure 2).



**Figure 2 Correction Model**

We continue analysis the new model by using Amos17.0 and the result shows that:  $\chi^2=113.601$ ,  $DF=30$ ,  $CFI=0.970$ ,  $TLI=0.954$ ,  $RMSEA=0.086$ . Description of model is not good. And the result show there is a correction factor of 5.550 between the residuals from “general level of satisfaction” and the “welfare level satisfaction”, which meant a high correlation between the two factors. So we added a two-way path, and further amended results show:  $\chi^2=107.870$ ,  $DF=29$ ,  $CFI=0.971$ ,  $TLI=0.955$ ,  $RMSEA=0.085$  and the model is still bad. So we add two-way path between residual from “system fairness itself” item and residual from “pay external fairness” item. Finally, the result shows:  $\chi^2=95.826$ ,  $DF=28$ ,  $CFI=0.975$ ,  $TLI=0.960$ ,  $RMSEA=0.080$ , indicating the model can reflect the deep-rooted relations from the data.

The SEM shows the path coefficient between pay satisfaction and pay fairness. As shown in Table 2, pay system fairness has a significant influence on pay structure and welfare satisfaction, comparison fairness as well. While, pay comparison fairness has a great relationship with pay level and welfare satisfaction.

**Table 2 Pay Fairness and Pay Satisfaction Path Coefficient**

Variables	Standard Path Coefficient	Path Coefficient	Standard Error	Critical Ratio	Significance
Pay comparison fairness<----Pay system fairness	0.929	0.693	0.027	25.866	***
Welfare satisfaction<----Pay system fairness	0.538	0.249	0.067	3.703	***
Pay structure satisfaction<----Pay system fairness	0.954	0.110	0.011	10.275	***
Pay level satisfaction<----Pay comparison fairness	0.726	0.189	0.012	15.440	***
Welfare satisfaction<----Pay comparison fairness	0.349	0.216	0.089	2.436	0.015

Notes: \*\*\* Means significant at the 0.001 level

## 5 Conclusions

We made empirical research on OEM employees' relationship between comparative fairness, institutional fairness and welfare, structure, pay level satisfaction by using SEM, and finally made the following conclusions.

### 5.1 The pay fairness is an important factor to pay satisfaction

The results show that the two dimensions of pay fairness have positive influence on pay satisfaction. Specially, pay comparison has a direct impact on welfare and pay level satisfaction, which means that when employees compared the wages, they not only cared about the absolute income, but also the welfare and security. At the same time, the pay system fairness also has direct influence on welfare and structure satisfaction. Therefore, the manager can improve the employees' pay satisfaction by modified the salary management system from internal equity and external competitiveness.

### 5.2 The pay system fairness has a great influence on pay structure satisfaction

Comparing the path coefficients between system fairness and each factor of the pay satisfaction, we found the coefficient between the pay structure satisfactions is 0.954 and highly significant, indicating that the system fairness has a great influence on the pay structure satisfaction. This conclusion is easy to understand, the operate salary structure can't formulate without appropriate remuneration system, only the enterprise to ensure that its pay distribution system is reasonable can improve the satisfaction of salary structure formulation to a high level. As a manager, who should first advocate establishing the pay distribution system led to actual job performance, then improve the fairness of the system itself, that would finally make employees feel satisfied with the remuneration distribution structure.

### 5.3 The pay system fairness has a large extent affection to comparison fairness

We can see from the result that the path coefficient between system and comparison fairness is 0.929 and highly significant (critical ratio=25.866), as indicates employees' perception from system comparison may seriously affect the fairness from comparison. Therefore, if the pay distribution system is not reasonable, staff may likely to suspicious whether their returning equity to their own efforts. So the manager should pay a high concern on the fairness of related distribution system, and make communication with them as usual, then the fairness of system will constantly improve.

This paper makes clear how the pay fairness affects the pay satisfaction, which may help OEM companies take more effective measures to enhance employees' pay satisfaction and increase their enthusiasm for work. However, there are still a few of limitations found in the paper. How does the pay level satisfaction influence the pay system fairness? What is the relationship among the welfare, structure, pay level satisfaction? All these matters can be studied in future research.

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# 1 Modeling and Analysis of University Library's Books Utilization Ratio

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**Abstract:** This paper constructs a model analyzing the university library's books utilization ratio by using the Markov Notion of transition probability matrix. Based on the books utilization data from 2006 to 2011 of the library of Wuhan University of Technology, we gain the utilization ratio of every type of the library's books. Then the author chooses five types of books of high utilization to analyze and to predict the weights of the utilization ratio in 2012, which can provide scientific base for book buyers to meet the readers' needs and promote the quality of service of the university library.

**Keywords:** University library; Transition probability matrix; Model; Utilization ratio

## 1 Introduction

The Library's main task is to provide readers with the book lending service. Therefore, library's books utilization ratio has become an important indicator to evaluate the service. Presently, the analysis of the quality of library service is mostly textual description. Little analysis was conducted from the quantitative point of view by analyzing the past information of library with the mathematical method. In fact, for any library, rational and scientific analysis of quality of service can be developed through the analysis of the books utilization ratio. Especially, a series of corresponding adjustment can be made to optimize the service.

## 2 Modeling of University Library's Books Utilization Ratio

### 2.1 Books utilization ratio

Books utilization ratio is a common term in the library statistic, whose definitions are slightly different in different materials. "Dictionary for Library and Information" defines it as follows: the ratio between the number of species and copies of the books utilized by readers in a certain library and information institutions and the total collection of species and copies<sup>[1]</sup>; The definition in "Foundation of Library Science": the percentage of the number of the books borrowed by readers in the total collection of books.

### 2.2 Establishment of markov model of books utilization ratio

Markov Notion of transition probability matrix makes use of the Markov process and analyzes the books' lending rate to solve the key issues in the library. However, due to the randomness of the Markov chain, it's difficult to investigate directly the transition probability matrix.<sup>[3]</sup> Here, the author establishes a mathematical model to analyze this issue and calculates the transition probability matrix as follows.

**Table 1 Parameters of the Mathematical Model**

Weight of lending rate /Year	First category	Second category	Third category	Total (%)
Year $t_1$	$a_1$	$b_1$	$c_1$	100
$t_2$	$a_2$	$b_2$	$c_2$	100
$t_3$	$a_3$	$b_3$	$c_3$	100
$t_4$	$a_4$	$b_4$	$c_4$	100

For the convenience of discussion, the author makes the vector of all kinds of books composed in the year of  $t_1$  as :  $v_1 = (a_1 \ b_1 \ c_1)$ , similarly, we can get :

$$v_2 = (a_2 \ b_2 \ c_2), v_3 = (a_3 \ b_3 \ c_3) \text{ and } v_4 = (a_4 \ b_4 \ c_4).$$

The matrix which is made of the weight of lending rate of all kinds of books in the year of  $t_1, t_2, t_3$  is



$$A = \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = \begin{pmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{pmatrix},$$

similarly, we can get:  $B = \begin{pmatrix} v_2 \\ v_3 \\ v_4 \end{pmatrix} = \begin{pmatrix} a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \\ a_4 & b_4 & c_4 \end{pmatrix}$

The vector which is made of the weight of lending rate of the books in the first category in the year of  $t_1, t_2, t_3$  is  $B_1 = \begin{pmatrix} a_2 \\ a_3 \\ a_4 \end{pmatrix}$ ,

Similarly, we can get:  $B_2 = \begin{pmatrix} b_2 \\ b_3 \\ b_4 \end{pmatrix}, B_3 = \begin{pmatrix} c_2 \\ c_3 \\ c_4 \end{pmatrix}$

Suppose that there exists a non-negative transition probability matrix  $T$ , the above three category change according to this rule, which causes

$$T = \begin{pmatrix} x_{11} & x_{12} & x_{13} \\ x_{21} & x_{22} & x_{23} \\ x_{31} & x_{32} & x_{33} \end{pmatrix} = (T_1 \quad T_2 \quad T_3)$$

Among them,  $T_1, T_2$  and  $T_3$  are three column vectors of  $T$

According to the model: Because the weight of lending rate of the categories in the year  $t_2 -- v_2$  is equal to the vector of original weight of lending rate in the year of  $t_1 -- v_1$  multiplied by  $T$ , that is  $v_2 = v_1 \cdot T$ ,

Similarly, we have:  $v_3 = v_2 \cdot T; v_4 = v_3 \cdot T$ .

Expand them; and we can get a set of simultaneous linear equations

$$\left\{ \begin{array}{l} a_1 x_{11} + b_1 x_{21} + c_1 x_{31} = a_2 \quad (1) \\ a_1 x_{12} + b_1 x_{22} + c_1 x_{32} = b_2 \quad (2) \\ a_1 x_{13} + b_1 x_{23} + c_1 x_{33} = c_2 \quad (3) \\ a_2 x_{11} + b_2 x_{21} + c_2 x_{31} = a_3 \quad (4) \\ a_2 x_{12} + b_2 x_{22} + c_2 x_{32} = b_3 \quad (5) \\ a_2 x_{13} + b_2 x_{23} + c_2 x_{33} = c_3 \quad (6) \\ a_3 x_{11} + b_3 x_{21} + c_3 x_{31} = a_4 \quad (7) \\ a_3 x_{12} + b_3 x_{22} + c_3 x_{32} = b_4 \quad (8) \\ a_3 x_{13} + b_3 x_{23} + c_3 x_{33} = c_4 \quad (9) \\ x_{11} + x_{12} + x_{13} = 1 \quad (10) \\ x_{21} + x_{22} + x_{23} = 1 \quad (11) \\ x_{31} + x_{32} + x_{33} = 1 \quad (12) \end{array} \right.$$

According to the characteristics of the equations, we can consociate (1)、(4)、(7) and we get:

$$\begin{cases} a_1x_{11} + b_1x_{21} + c_1x_{31} = a_2 \\ a_2x_{11} + b_2x_{21} + c_2x_{31} = a_3 \\ a_3x_{11} + b_3x_{21} + c_3x_{31} = a_4 \end{cases}$$

This coefficient matrix of equations is  $A$ , the constant column vector is  $B_1$ , thus it can be written in the

form of matrix:  $AT_1 = B_1$

Similarly, we can get:  $AT_2 = B_2, AT_3 = B_3$

Thus, we get :  $AT = B$ , we know:  $T = A^{-1}B$

That is,

$$T = \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix}^{-1} \cdot \begin{pmatrix} v_2 \\ v_3 \\ v_4 \end{pmatrix}$$

The above formula can be generalized to a wider range of circumstances<sup>[4][5]</sup>.

### 2.3 Empirical analysis of university library’s books utilization ratio

Taking the library of the Wuhan University of Technology for example, according to the numbers of the copies of all the books and lending books in the year 2006-2011, we can get the lending rate. When we get adequate data, we can make a prediction of the utilization rate of every type of books. The prediction results can be used as reference for the procurement staff to determine the variety and the quantity of the books, which can optimize the collection structure and improve the quality of library services.

The library of Wuhan University of Technology has various kinds of books, about 3.5 millions copies, which are divided into Marxism-Leninism, philosophy, general social sciences, politics and law, military affairs, economics, Liberal arts, education and sports, language, literature, literature, history and geography, general natural science, physics and chemistry, astronomy and earth, food science, medicine and health, agricultural science, industrial technology, transportation, aerospace, environment and labor insurance and comprehensive books. Due to the limited data, combined with the characteristics of the model, five kinds of books are selected to be analyzed. We believe that the conclusion from the model would be more accurate with adequate data.

**Table 2 Rate of Utilization of five Kinds of Books in Library of WHUT from 2006 to 2011**

Rate of Utilization/Year	Philosophy	Economics	Literature	Mathematics, physics and chemistry	Industrial technology
Year of 2006	1.837564	1.146315	4.782194	0.966729	1.048346
2007	1.736976	0.972445	3.676339	0.809631	0.879284
2008	1.577993	0.862638	2.828429	0.796822	0.866895
2009	1.213401	0.629463	2.214991	0.595028	0.733167
2010	1.253685	0.590676	2.474701	0.570414	0.674396
2011	1.044239	0.458191	1.802224	0.518558	0.580066

These data were processed according to the model and then we get the weight value of utilization ratio of these five kinds of books.

**Table 3 Weight Value of Five Kinds of Books in Library of WHUT from 2006 to 2011**

Weight Value/Year	Philosophy	Economics	Literature	Mathematics, physics and chemistry	Industrial technology	Total
2006	0.1879	0.1172	0.4889	0.0988	0.1072	1
2007	0.2151	0.1204	0.4553	0.1003	0.1089	1
2008	0.2276	0.1244	0.4080	0.1149	0.1250	1

2009	0.2253	0.1169	0.4112	0.1105	0.1361	1
2010	0.2253	0.1062	0.4448	0.1025	0.1212	1
2011	0.2372	0.1041	0.4093	0.1178	0.1317	1

We make use of the method in the model to estimate the weight value in the year of 2011

**Table 4 Estimation of Weight Value in 2011**

Weight Value/ Year	Philosophy	Economics	Literature	Maths, physics and chemistry	Industrial technology	Total
2006	0.1879	0.1172	0.4889	0.0988	0.1072	1
2007	0.2151	0.1204	0.4553	0.1003	0.1089	1
2008	0.2276	0.1244	0.408	0.1149	0.125	1
2009	0.2253	0.1169	0.4112	0.1105	0.1361	1
2010	0.2253	0.1062	0.4448	0.1025	0.1212	1
2011	$a_1$	$a_2$	$a_3$	$a_4$	$a_5$	1

Here,  $V = (a_1 \ a_2 \ a_3 \ a_4 \ a_5)$  is unknown and it's the weight value to be predicted. According to the formulas in the model, we can get:

$$A = \begin{pmatrix} 0.1879 & 0.1172 & 0.4889 & 0.0988 & 0.1072 \\ 0.2151 & 0.1204 & 0.4553 & 0.1003 & 0.1089 \\ 0.2276 & 0.1244 & 0.4080 & 0.1149 & 0.1250 \\ 0.2253 & 0.1169 & 0.4112 & 0.1105 & 0.1361 \\ 0.2253 & 0.1062 & 0.4448 & 0.1025 & 0.1212 \end{pmatrix}$$

Its inverse matrix:

$$A^{-1} = \begin{pmatrix} -29.0478 & 29.3329 & -5.3785 & -9.8370 & 15.9298 \\ -17.5353 & 79.3542 & -30.8753 & 48.7961 & -78.7427 \\ 6.9005 & -4.2073 & -4.3648 & -4.0070 & 6.6783 \\ 51.4403 & -136.4844 & 131.9363 & -106.2249 & 60.3459 \\ 0.5343 & 6.8067 & -58.5089 & 80.0701 & -27.9081 \end{pmatrix}$$

$$B = \begin{pmatrix} 0.2151 & 0.1204 & 0.4553 & 0.1003 & 0.1089 \\ 0.2276 & 0.1244 & 0.4080 & 0.1149 & 0.1250 \\ 0.2253 & 0.1169 & 0.4112 & 0.1105 & 0.1361 \\ 0.2253 & 0.1062 & 0.4448 & 0.1025 & 0.1212 \\ a_1 & a_2 & a_3 & a_4 & a_5 \end{pmatrix}$$

As to its transition probability matrix, from  $T = A^{-1}B$ , we can get:

$$T = \begin{pmatrix} -3.0001+15.9298a_1 & -1.5218+15.9298a_2 & -7.8448+15.9298a_3 & & \\ 18.3267-78.7427a_1 & 9.3332-78.7427a_2 & 33.4013-78.7427a_3 & & \\ -1.3595+6.6783a_1 & -0.6284+6.6783a_2 & -2.1519+6.6783a_3 & & \\ -14.2063+60.3459a_1 & -6.6430+60.3459a_2 & -25.2615+60.3459a_3 & & \\ 6.5219-27.9081a_1 & 2.5748-27.9081a_2 & 14.5767-27.9081a_3 & & \\ -1.1458+15.9298a_4 & -1.4210+15.9298a_5 & & & \\ 8.9489-78.7427a_4 & 9.7216-78.7427a_5 & & & \\ -0.6843+6.6783a_4 & -0.8541+6.6783a_5 & & & \\ -6.8317+60.3459a_4 & -6.3766+60.3459a_5 & & & \\ 2.5776-27.9081a_4 & 2.6505-27.9081a_5 & & & \end{pmatrix}$$

According to the nature of the model, we can get the elements of matrix  $T \in [0, 1]$

The answers are:

$$\begin{aligned} a_1 &\in (0.2354, 0.2511) \\ a_2 &\in (0.1101, 0.1185) \\ a_3 &\in (0.4115, 0.4242) \\ a_4 &\in (0.1132, 0.1136) \\ a_5 &\in (0.1279, 0.1520) \end{aligned}$$

Through the actual data:  $a_1 = 0.2372, a_2 = 0.1041, a_3 = 0.4093, a_4 = 0.1178, a_5 = 0.1317$ , among which

$a_1$  and  $a_5$  are in the range obtained. The differences between  $a_2, a_3, a_4$  and the actual data are respectively 0.0060, 0.0022 and 0.0042.

Based on the situation of Wuhan University of Technology, Some books of earlier classification have been made some adjustment according to the present classification and this process has been continued. In addition, the library has backtracked and built a database, which brought much more old books. And at the same time, the number of new booking has increased. Thus the total amount of book collections has increased while the number of books that have been read and lent hasn't grown, which means the decline of the utilization rate. This analysis shows that the weight of utilization ratio of the year 2011 which was calculated from the established model is credible, and when sufficient data can be obtained, we can also predict the value of the specific utilization rate of all the categories based on this model.

We use this method to predict the weight values of utilization ratio of these five categories in the year of 2012 as follows:

Suppose that the weights of these five kinds of books, philosophy, economic, literature, mathematics, physics and chemistry, Industrial technology are respectively  $b_1, b_2, b_3, b_4, b_5$  in 2012. And then we can get the matrix of the weights of utilization ratio of these five kinds of books in these years (2006--2011):

$$A_1 = \begin{pmatrix} 0.2151 & 0.1204 & 0.4553 & 0.1003 & 0.1089 \\ 0.2276 & 0.1244 & 0.4080 & 0.1149 & 0.1250 \\ 0.2253 & 0.1169 & 0.4112 & 0.1105 & 0.1361 \\ 0.2253 & 0.1062 & 0.4448 & 0.1025 & 0.1212 \\ 0.2372 & 0.1041 & 0.4093 & 0.1178 & 0.1317 \end{pmatrix}$$

Its inverse matrix is

$$A_1^{-1} = \begin{pmatrix} -175.5965 & 184.3607 & -114.6497 & 228.5385 & -121.6225 \\ -44.3559 & 83.6648 & -14.4763 & 49.6031 & -73.4200 \\ 44.4748 & -49.4384 & 20.8918 & -43.8282 & 28.8921 \\ 226.4220 & -204.0700 & 79.3863 & -316.1596 & 215.3794 \\ 10.5762 & -61.9990 & 81.9981 & -31.8189 & 2.2372 \end{pmatrix}$$

From the above analysis, we can get the weights of utilization ratio of these five kinds of books in these years (2007--2012) :

$$B_1 = \begin{pmatrix} 0.2276 & 0.1244 & 0.4080 & 0.1149 & 0.1250 \\ 0.2253 & 0.1169 & 0.4112 & 0.1105 & 0.1361 \\ 0.2253 & 0.1062 & 0.4448 & 0.1025 & 0.1212 \\ 0.2372 & 0.1041 & 0.4093 & 0.1178 & 0.1317 \\ b_1 & b_2 & b_3 & b_4 & b_5 \end{pmatrix}$$

Therefore,,from the formulas  $T_1 = A_1^{-1}B_1$  , we can get its transition probability matrix:

$$T_1 = \begin{pmatrix} 29.9495 - 121.6225b_1 & 11.3226 - 121.6225b_2 & 46.7104 - 121.6225b_3 \\ 17.2586 - 73.4200b_1 & 7.8888 - 73.4200b_2 & 30.1692 - 73.4200b_3 \\ -6.7051 + 28.8921b_1 & -2.5905 + 28.8921b_2 & -10.8296 + 28.8921b_3 \\ -52.0200 + 215.3794b_1 & -20.1703 + 215.3794b_2 & -85.6265 + 215.3794b_3 \\ -0.7771 + 2.2372b_1 & -0.5362 + 2.2372b_2 & 2.2704 + 2.2372b_3 \\ 15.3661 - 121.6225b_4 & 19.3449 - 121.6225b_5 \\ 8.5079 - 73.4200b_4 & 10.6205 - 73.4200b_5 \\ -3.3743 + 28.8921b_4 & -4.4093 + 28.8921b_5 \\ -25.6404 + 215.3794b_4 & -31.4878 + 215.3794b_5 \\ -0.9791 + 2.2372b_4 & -1.3684 + 2.2372b_5 \end{pmatrix}$$

From the nature of the model, we can get the elements of the matrix  $T \in [0,1]$

The answers are:

$$\begin{aligned} b_1 &\in (0.2321, 0.2462) \\ b_2 &\in (0.0938, 0.1074) \\ b_3 &\in (0.3976, 0.4022) \\ b_4 &\in (0.1190, 0.1237) \\ b_5 &\in (0.1526, 0.1591) \end{aligned}$$

At this point, the author has completed the prediction of the weight of utilization ratio of these five types of the books in the year of 2012.

### 3 Conclusions

This paper makes use of Markov Notion of transition probability matrix to establish a model analyzing the university library's books utilization ratio, calculating the utilization ratio of books of different categories and evaluating the service of the library. By analyzing the weights of utilization ratio of these five categories of books in these years (2006--2011) and in comparison with actual data, the established model has been proven to be scientific. As a result, this model can be used to predict the future utilization ratio of books of all the categories. In particular, the prediction of the weights of utilization ratio provides a reference for the procurement of new books of libraries and predicts the future weights of utilization ratio of all kinds of books for the library, which can guide the book buyers to develop a reasonable procurement programs, maximize the efficiency and improve the utilization ratio of the books.

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## An Investigation into the Impact of Investor Relations on the Turnover Rate in the Capital Market

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**Abstract:** This paper takes the listed companies in China as the samples, describes the relationship between stock price volatility, stock turnover, companies' performance and investor relations by use of correlation analysis and regression analysis. Empirical results show that well investor relations is conducive to reducing the volatility of share prices and stock turnover, which ensures the companies' share stability in the capital market and improves the companies' performance, and IRM has been developed into an important business tool for companies' communication strategies.

**Key words:** Investor Relations; turnover rate; Volatility rate; Corporate Performance; Multiple linear regression model

### 1 Introduction

The companies traditionally rely on loans more than equity capital, but with the continuous development of capital markets, equity capital to growing enterprises, the company's stock performance in the capital market impact of the company have become increasingly prominent. Today, the company is considered the value of the stock market performance to identify and test used to measure the success of the standard indicators and factors. There is evidence that an investor relation is indeed important in obtaining the support of financial entities to play a key role. Investor relations management can help companies and analysts, investors and potential investors with the Company relating to the communication of information between financial entities, financial entities to help understand the market structure, company positioning, at the same time provide some technical support platform, to help investors access to the company's tangible information, facts and data to assess the success or failure of company information. Through information disclosure to reduce the external trading companies to obtain valuable information on fixed costs, investor relations management can also be attractive to investors, the company's size and has a significant impact on performance, and ultimately affect the value of the company

Well investor relations can be more effective in reducing investors' doubt to the companies, and reducing their non-rational behavior. In this way, it could help investors establish the confidence to the companies, so that stocks' stability can be ensured. In the long term, it is helpful for the companies to develop healthily in the capital market and ultimately enhance corporate performance and value.

As early as 1969, Investor Relations Institute (NIRI) defined investor relations management as a strategic management actives, which is responsibility using the disciplines of communication with investors to show them transparently the companies' information and construct companies' good image in the capital market. By 1996, investor relations was added the connotation of marketing in the original basis of definition by NIRI. In 2003, it was defined again, which is investor relations is a corporate activity, combining the disciplines of finance, marketing and communications, which provides present and potential investors with an accurate portrayal of a company's performance and prospects so that they can make properly informed investment decisions. In the new definition, two-way communication is explicitly included. Investor relations have become the link between the financial community and the corporate. It helps the companies to provide information which could reduce information asymmetry, helps the financial community and investors to assess the companies. Today, the majority of large listed companies attach great importance to investor relations.

According to agency theory and asymmetric information theory, investor relations could reduce the agency costs. So it considered as a solution to information asymmetry. If managers deem it necessary to attract and retain investment in the main, the companies will fund the implementation of investor relations. Through investor relations, it could achieve effective communication and coordination between managers and investors. Thereby the information asymmetry is reduced, and more investors are attracted.

Investor relations are a part of comprehensive, integrated information communication. The successful investor relations could impact corporate image through advertising and media-to create a feeling of well-known and loved-so as to enhance the performance and appraisalment in the capital

market (Gregory, 1997). There is no doubt that investor relations will affect the company's performance. Good investor relations will bring lower financing costs, smooth financing channels, more patient investors (Ma Lianfu, Zhao Ying, 2006). A large number of research literatures also show that investor relations may affect the companies' market value and investors' potential evaluation, and the companies with good record of investor relations tend to the good performance (Hall, 1992). Therefore, effective investor relations can reduce costs and risks, and impact stock returns and liquidity (Nash, 2005).

## 2 Investigations Design and Method

### 2.1 Samples Selection and Data

In this paper, our sample companies are listed companies in China in 2007. After excluding the companies lacking of available data, being ST and belonging to financial listed companies, it results in a final sample of 885 companies.

The level of IRM is from the analysis to corporate governance self-examination report released in 2007. Other data is from Wind database.

### 2.2 The Measurement to IRM

In this paper, factor analysis method is taken to evaluate comprehensively the IR level of listed companies in China. According to the IRM index designed by IRM Study Group of The Research Center of Corporate Governance of Nankai University in 2005 and 2006(see table 1), listed companies' self-examination report on corporate governance published in 2007 are arranged. If the item in the index is taken, then it is calculated as 1 on this item, or it is 0. By use of factor analysis, three factors' scores are got and eventually every listed company's IRM level score is got, which three factors mean the level of information disclosure, the level of information feedback and the level of organization indemnification.

**Table 1 IRM Index**

Target layer index	Sub factor layer	Subdivided layer
IRM level	level of information disclosure	Does the company post the archives and annual report to the investors?
		Does the company receive news report and is it cooperative?
		Is there any meeting for analyst, performance and road show?
		Does the company follow and keep contact with the analyst?
		Do the companies compile the weekly report of IR, the weekly report of stork tidings and IR manuals?
	level of information feedback	Is there any management of IR such as telephone-consulting, fax, mail, or exclusive hunt line and regular activities?
		Is there any facilities of network communication (The column of IR management and inquiring, website and its updating, BBS of IR and mailbox for IR)
		Is there one-one communication (Face to Face communication, The communication on the spot, Receiving the visit of investor and the Field visit & study)
		Is there any active contact or visit organized by the company?
	level of organization indemnification	Is there a department in charge of the IR in your company?
		Are there any stipulations for IR in your company?
		Is there any the intercommunication on net
		Does the company have the training for the staff of IR management?

### 2.3 Hypotheses

First of all, the article studies the relationship between IRM and the capital flows in stock market. In the case of information asymmetry, the agent with few information tends to show followers' performance, while the agent with more information tends to take contrarian strategies. Well IRM could establish the open information channels between the investors and the companies, which could maintain the relationship between two agent parties so that the investors could hold more confidence to the companies and hold their stocks long-term. Based on this, the article makes the following assumption.

H1: The level of IRM is negatively correlated with stock turnover rate with other conditions unchanged. The better IRM could lower stock turnover rate, same on the contrary.

Secondly, the article studies the relationship between IRM and the stock price's change. In the



capital market, investors are very sensitive to information and the disclosure and contents of information will influence the investors' decision-making which will affect stock price in the end. Patell (1976) found that if the management holds the information that not affected the price yet, and the price will change immediately as soon as the information disclosures. Nittai K. Bergman and Sugata Roychowdhury (2008) also found that companies' disclosure policy and affect investors mood so that bias investors expect and affect stock price further. Information disclosure level could affect investors' sentiment, resulting in price fluctuation. Well IRM could effectively reduce the information asymmetry between investors and companies, and reduce the impact of noise. All of these could help investors make decisions more rationally which is conducive to stocks' stability in capital market. Based on this, the article made the following assumption.

H2: The level of IRM is negatively correlated with stock price fluctuation rate with other conditions unchanged. The better IRM could lower stock fluctuation rate, same on the contrary.

Finally, the article studies the relationship between IRM and companies' performance. According to agency theory of Coase (1937), Jensen and Meckling (1976) believe that accounting information is aimed at monitoring managers' behavior to reduce agency cost. Admati and Pfleiderer (2000) believe that companies' value is correlated with the companies' disclosure information that is taken by investors. Watts and Zimmerman (1978) also believes that companies should increase voluntary information disclosure in order to avoid the press from government and stakeholders, which may lead to increased agency cost in the future. Fishman and Hagerty (1989) find that IRM could reduce the fixed cost for external traders to get valuable information by information disclosure. Marcus and Wallace (1997) study the disclosure practice of U.S companies, and find IRM have significant impact on companies' size and performance. Well IRM not only can effectively reduce agency cost, but also can increase the value of companies' reputation, reduce the information asymmetry between investors and companies as far as possible. In this way, the effective communication channels could be built and companies' performance is enhanced thereby. Based on this, the article made the following assumption.

H3: The level of IRM is positively correlated with companies' performance with other conditions unchanged. The better IRM could increase companies' performance, same on the contrary.

#### 2.4 Empirical model and variable measurement

Multiple linear regression analysis method is taken to test the hypothesis. The IRM variables used in this study are the level of IRM measured by use of factor analysis, which are independent variables. The dependent variables are stock flowing status, stock price fluctuation status and companies' performance, which are measured by stock turnover rate, stock price fluctuation rate and companies' EPS respectively. Control variables include: 1) the natural logarithm of total assets (*LNSIZE*); 2) leverage (*DTA*); 3) cash flow per share (*CASH*); 4)  $\beta$  value (*RISK*). To find out how the IRM relates to the stock flowing status, stock price fluctuation status and companies' performance separately, we run regressions, using the following model:

$$TUVR = \beta_0 + \beta_1 IRM + \beta_2 LNSIZE + \beta_3 DTA + \beta_4 CASH + \beta_5 RISK + \varepsilon_1 \quad (1)$$

$$VOL = \alpha_0 + \alpha_1 IRM + \alpha_2 LNSIZE + \alpha_3 DTA + \alpha_4 CASH + \alpha_5 RISK + \varepsilon_2 \quad (2)$$

$$EPS = \gamma_0 + \gamma_1 IRM + \gamma_2 LNSIZE + \gamma_3 DTA + \gamma_4 CASH + \gamma_5 RISK + \varepsilon_3 \quad (3)$$

### 3 Empirical Results

#### 3.1 Descriptive statistics

Table 2 shows the descriptive statistics of all variables.

**Table 2 Descriptive statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
<i>TUVR</i>	885	0.69	11.14	4.69	1.57
<i>VOL</i>	885	2.69	15.92	4.02	0.60
<i>EPS</i>	885	-3.15	5.53	0.35	0.52
<i>IRM</i>	885	-1.48	1.53	0.02	0.58
<i>LNSIZE</i>	885	-9.21	27.30	21.65	1.51
<i>DTA</i>	885	0.91	156.72	50.77	17.65
<i>CASH</i>	885	-7.65	9.87	0.40	1.02
<i>RISK</i>	885	-0.24	1.37	0.98	0.18

### 3.2 Regression Analysis

Correlations between IRM and dependent variables are presented in Table3. There is a high negative correlation between IRM level and stock turnover rate, indicating that well IRM could help companies lower investors' speculative behavior which is conducive to stock's stability in capital market. Hypothesis 1 can be confirmed. There is a high negative correlation between IRM level and stock price fluctuation rate, indicating that well IRM could help companies lower stock price's fluctuation which is conducive to stock price's stability in capital market. Hypothesis 2 can be confirmed. There is a high positive correlation between IRM level and EPS, indicating that well IRM could help companies increase companies' performance, and hypothesis 3 can be confirmed.

**Table 3 Correlations**

		<i>TUVR</i>	<i>VOL</i>	<i>EPS</i>
<i>IRM level</i>	Pearson Correlation	-0.084**	-0.068**	0.115***
	Sig. (2-tailed)	0.012	0.044	0.001
	N	885	885	885

Note: \*\*\*,\*\* denote significance at 0.01 and 0.05 level (2-tailed), respectively.

**Table 4 Regressions results**

Variables	Model 1			Model 2			Model 3		
	Coefficient	Std. Dev.	p-value	Coefficient	Std. Dev.	p-value	Coefficient	Std. Dev.	p-value
(Constant)	8.052***	0.709	<0.01	4.225***	0.279	<0.01	-1.259***	0.237	<0.01
<i>IRM</i>	-0.213**	0.084	0.011	-0.071**	0.033	0.031	0.075***	0.028	0.008
<i>LNSIZE</i>	-0.286***	0.034	<0.01	-0.063***	0.013	<0.01	0.084***	0.011	<0.01
<i>DTA</i>	0.012***	0.003	<0.01	0.007***	0.001	<0.01	-0.006***	0.001	<0.01
<i>CASH</i>	-0.231***	0.048	<0.01	-0.051***	0.019	0.007	0.132***	0.016	<0.01
<i>RISK</i>	2.346***	0.284	<0.01	0.840***	0.111	<0.01	0.010	0.095	0.917
R <sup>2</sup>	0.161			0.117			0.163		
Adj- R <sup>2</sup>	0.156			0.112			0.158		
F	33.736			23.245			34.135		
Pr>F	<0.0001			<0.0001			<0.0001		

Note: \*\*\*,\*\* denote significance at 0.01 and 0.05 level (2-tailed), respectively.

Table4 shows the result of regression models. After controlling companies' size, leverage, cash flow per share and risk, there is a high negative correlation between IRM level and stock turnover rate & stock price fluctuation rate respectively (p=0.031,p=0.011), and there is a high positive correlation between IRM level and EPS (p=0.008). According to regression result, well IRM could help the company lower investors' speculative behavior, because effective communication and disclosure could lower information asymmetry. One hand, investors could make the rational judgment by enough information; on the other hand, it could help investors build the confidence to the companies due to investors prefer to hold the stocks long-term. All of these are conducive to the companies' stable and well development, which could reduce the company's agency cost and enhance the company's performance eventually.

### 4 Conclusions

In this paper, we develop models to study the incentives of IRM level to stock flowing, stock price fluctuation and companies' performance. We find that well IRM could help companies lower investors' speculative behavior which is conducive to stock's stability in capital market; well IRM could help companies lower stock price's fluctuation which is conducive to stock price's stability in capital market; well IRM could help companies increase companies' performance.

IRM can help companies to win the support of financial stakeholders, which is conducive to stay and attract shareholders, and IRM has been developed into an important business tool for companies' communication strategies. Well IRM could reduce the volatility in capital market, and guide the

investors from speculators to the direction of genuine investors. At the same time, well IRM could reduce information asymmetry, which could reduce noise interference to investors. Besides, well IRM plays an important role in reducing agent cost, enhancing companies' reputation and ultimately enhancing companies' performance. Therefore, strengthening IRM of listed companies has a positive role not only macroscopically but also microcosmically. With the continuous development of capital market, IRM departments are rising rapidly and occupy an important position in many organizations. At present, China's listed companies' IRM is still in its initial stage, and the overall level is lower with numerous deficiencies. So it is more urgent for all stakeholders to work together to enhance IRM in China.

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## Study of the Correlation Between Dominant Indicator of University Presidents and University Ranking

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**Abstract:** This paper is a study about the relationship between the university president and the university ranking, has collected the Chinese 100 "211" university president's basic information and the school ranking change before and after president's tenure. To carry on the empirical analysis with the president's Gender, Nationality, Graduation School, Highest Degree, Major, Took Office Age, Tenure, Over Experience, Academic Title, National Projects and the Number of Papers Published by SPSS software. The result indicated that, only two factors of tenure and graduates school has certain influence to the school, other factors do not have the significance correlation to school. This paper also provides certain model significance for the university president's election.

**Key words:** University president; University ranking; Dominant indicator; Correlation analysis

### 1 Introduction

President has the pivotal status and the function in the higher education development and first-class university president created first-class university. Generally speaking, the famous university's behind all has a series of famous president's name, As a school's highest executive, university president should have an important influence to a school steady movement progress development. To run an excellent university, must have the good school management, good president, good party committee secretary. Many scholars also thought university presidents have the increasingly vital role in the university construction and developing process. To a some extent, the university's competition essence will be the competition of president's quality and the president will become a school soul. Although most scholars agree that university presidents have an important influence to schools, but we found that in many university ranking institutions does not consideration the factor of president. Whether the university president really affect the the school? Which president's aspects have the function? This paper uses the method of correlation analysis to search the influence factor that university president to the university power, hoped provides some suggestions for Chinese university president's selection.

The scholars have done the massive research to university president. American College President is a series of research to American university presidents. In the report of "The American College President: A 1993 Edition", to make comprehensive data analysis for thousands of samples and make comparison for the data of 1990 and 1986, the authors obtained the characteristic which a model US president has (Ross, 1993). On the other report, "The American colleges of president: 2007 edition", To carry on the statistics for the changes which the American president's essential feature, the professional characteristic and some are noteworthy, and carried on the data change from 1986 to 2006 with the graph description, through analysis these data change, thought the university president's structure was changing, and had to undertake the responsibility more and more (King, 2007). For American higher education, it was suggested that university president must have certain political quality and method of carry out (Kauffman, 1974). There is a study on university presidents from the demographic characteristics, educational background, professional background and future plans (Weisman&Vaughn, 2006). In China, what the principal is our universities need? What qualities are a good president should have? Scholars have made a lot of research on these issues. From the president's role, Some scholars pointed out that the first-class university presidents should first of all is an education experts, need to have a certain ability to innovate, but also is scholar, good manager, and outstanding social activist (Niu, 2004). With the development of society, the higher education's function are changing and modern university president's responsibilities are no longer limited to the leadership of academic, management and teaching, also includes how to business and management school, which requires modern university president need to have a certain political quality, academic quality, education quality and management capabilities. In addition, many scholars make study from the background of the university presidents, to investigate the common background characteristics of the presidents on top university. For example, there is a study on university president with demographic characteristics, education background, professional background and academic

background (Meng, Zhang & Zhang, 2012).

It can be seen from the above, the research of university presidents is quite comprehensive, and also indirectly shows that study the relationship between university president and modern university are very meaningful. But now researches mostly focus on one characteristic of the university president, or only through statistical description on the background of the university presidents. There has little research on the problem whether these factors affect the development of the university. Moreover, speculatively research too much, empirical research seems too less. Therefore it is very difficult to comprehensive reflect the relationship between president and university. In future studies, we need to do more in-depth empirical analysis under the actual situation. Based on this, this paper borrows the knowledge of Statistics and SPSS software to analysis the data of 100 Chinese presidents.

## 2 Data and Method

### 2.1 Indicator system

How to choose indicator to weighed president? This paper has also referred some indicator system from other correlation research. For example, a research use the population statistics, the educational background, the work background, the academic background these university president's background characteristics as the indicators (Meng, Zhang&Zhang, 2012). Unifies the actual situation, the factors of personality charm, education idea, education thought intrinsic are very difficult to. Therefore when select president's basic indicators, we choose those dominant indicators as possible. The dominant indicator meant the data may observe and the collection directly and can be quantify. This paper select the indicators include: Gender, Nationality, Graduation School, Highest Degree, Major, Took Office Age, Tenure, Over Experience, Academic Title, National Projects and the Number of Papers Published.

### 2.2 Sample selection

This paper chooses 100 Chinese “211” project university's presidents as sample. The “211” university is China face the 21st century to focus on building about 100 universities and a batch of key disciplines, have certain representation. At present, the “211”universities actually altogether have 112 in China, in which North China Electric Power University, China University of Petroleum, China University of Geosciences, China University of Mining and Technology have two school areas. Moreover also have three military class universities such as The Second Military Medical University, The Fourth Military Medical University and National University of Defense Technology. Because we select the university ranking comes from the “Netbig Chinese University Ranking”, the military university has not contained in the ranking table, therefore we select the number of university sample actually is 109.

In order to carries on the analysis better,there have some requests when we select the presidents. First, selects the president who is appointed in the recent ten years, this is considered the data of presidents collection is easy for near ten year and the information lose few and more accurate, simultaneously has also avoided the environment in different time to influence the ranking of university, In addition the “Netbig Chinese University Ranking” we select is began in 1999. Second, president's tenure have four years at least, this is because the general cycle of president is four years,and the tenure is too short also does not reflected the influence that president to the university. This paper data comes from university's official website, CNKI (China National Knowledge Infrastructure) database and introduce on net.

The ranking standard of university come from the “Net big Chinese University Ranking” in this paper,the ranking change to be reference by selects before and after the president's tenure. (See Table 1) It is the scope situation that complete 109 school ranking rises ,falls and changes , in which ranking rise scope biggest is 200, ranking drop scope biggest is 74.The entire ranking up and down distribution comparison average, is better for carries on the correlation analysis.

**Table 1 University Rankings Change**

	<5	5-10	11-15	16-20	21-25	26-30	>30	Total
Up	21	9	5	2	5	2	11	55
Down	15	6	6	8	2	3	8	48
Constant	6	-	-	-	-	-	-	6

### 2.3 Analytical method

This paper uses statistical methods to classify and organize the president's data, and find the commonalities between them. At the same time, using SPSS 16.0 software does correlation analysis between the data of president and school rankings change.

### 3 Results

It is the correlation coefficient that analysis the president 's each indicator and the school ranking change (See Table 2).

**Table 2 Correlation Coefficient between President and University**

	Ranking rise and drop	Ranking change scope
Gender	-	-
Nationality	0.080	0.149
Graduation School	0.188*	0.135
Highest Degree	0.042	0.035
Major	0.023	0.016
Took Office Age	0.009	0.175
Tenure	0.182	0.256**
Over Experience	0.037	0.090
Academic Title	0.124	0.033
National Projects	0.041	0.162
Number of Papers Published	0.107	0.031
Paper with University or Education	0.057	0.021

\* Said when user specifies the significant level of 0.05, statistics test companions probability value is less than or equal to 0.05. \*\* Said when user specifies the significant level of 0.01, statistics test companions probability value is less than or equal to 0.01

From the table we can see, except president's graduation university and the university ranking fluctuation has the significance correlation when the significant level is 0.05, president's tenure and the school ranking change scope has the significance correlation when the significant level is 0.01, other president's indicators to the school ranking fluctuation and the school ranking change scope does not have the significance correlation.

The specifically explained for indicators as follow.

1) Gender. Complete 109 university's presidents are the male in the sample. The sample does not have the difference, therefore is unable to carry on the relevant judgment.

2) Nationality. In the sample, the ranking up university's 55 presidents have 53 peoples are Han Nationality and accounts for 96.4%, the ranking down university's 48 presidents have 45 peoples are Han Nationality and accounts for 93.8%, all ranking not change university's presidents are the Han Nationality. Discover from the sample that, Han Nationality's presidents are majority and Minority Nationality's presidents are few, but the proportion difference is not big in the university that ranking up and down and does not have the obvious relevance with the school ranking change.

3) Graduation school. Through correlation analyses from Table 2, we can know whether president graduates from now work school and school ranking existence certain relevance. Looking from the entire construction of data that, 109 presidents have 57 peoples are graduate the school which is work now, 55 presidents who the school ranking up have 28 peoples are graduate from now work school and accounts for 50.9%, 48 presidents who the school ranking down have 19 peoples are graduates from now work school and accounts for 39.6%, 6 presidents who the school ranking constant have 5 peoples are graduates from now work school and accounts for 83.3%.In ranking up school the proportion that president graduates from now work school obviously is higher than the proportion that president graduates from now work school.

4) Highest degree. Has 2 president's highest degree in the complete 109 samples to be unclear, the effective sample is 107, in which 85 doctors, 17 masters, 5 bachelors. In ranking up school that 52 presidents have 41 doctors, 11 masters, 1 bachelor. In the ranking down school that 48 presidents have 39 doctors, 5 masters, 4 bachelors. In the ranking Constant school that 6 presidents have 5 doctors, 1 master. From the entire data, the presidents who are doctor is majority, also different highest degree

presidents distribute the average in the ranking up and down school, it is not obvious relevance with the school ranking change

5) Major. The major discrimination based on Chinese 13 discipline class at present, in which has not considered the military universities, therefore does not have the military major in the complete 109 samples, moreover has 1 president's major to be unclear. The distributed situation sees the Figure 1. The presidents who are engineering and science gain advantage, to see the ranking up and down school, except the engineering differ 8, the other major distinguish is not very big. And the correlation coefficient from Table 2 indicates president's major and the school ranking change have not obvious relevance.

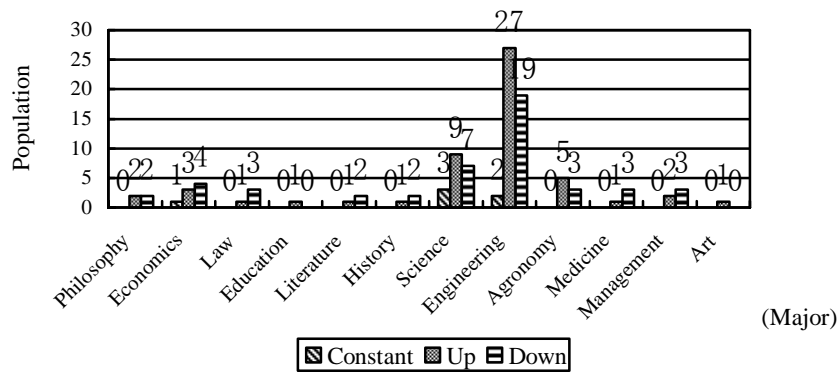


Figure 1 Major of University Presidents

6) Took office age. Except 1 president's birth years unclear, the took office age of presidents basically on from 40 years old to 60 years old, in which smallest 37 years old, biggest 71 years old. The distribution situation see the Table 3. Looked from the distribution situation that, the took office age of presidents in ranking up school to concentrate mostly in 40 years old to 50 years old (57.3%), the took office age of presidents in ranking down school to concentrate mostly in 45 years old to 55 years old (58.3%), but the correlation analysis result indicated between president's took office age and the school ranking change does not have the significance related.

Table 3 Took Office Age of President

Age	<40	40-45	46-50	51-55	56-60	>60	miss
Ranking up	2	16	21	9	7	0	0
Percentage	3.6%	29.1%	28.2%	16.4%	12.7%	0%	0%
Ranking down	0	11	15	13	7	1	1
Percentage	0%	22.9%	31.2%	27.1%	14.6%	2.1%	2.1%
Ranking Constant	0	0	2	1	3	0	0
Percentage	0%	0%	33.3%	16.7%	50%	0%	0%

7) Tenure. From Table 3 we found the tenure of president has influence to school. Considered the tenure excessively short cannot reflect the influence that president to school, so the president's tenure we select are few is 4 years, in which the tenure longest is 17 years. Special details as shown in the Figure 2, from the figure can find, the population of presidents in the school ranking down more than the population of presidents in the school ranking up when the tenure below 8 years, but when the tenure above 8 years, except the tenure is 10 years, the situation to the purpose. Therefore said the length of president's tenure has certain influence to the school power.

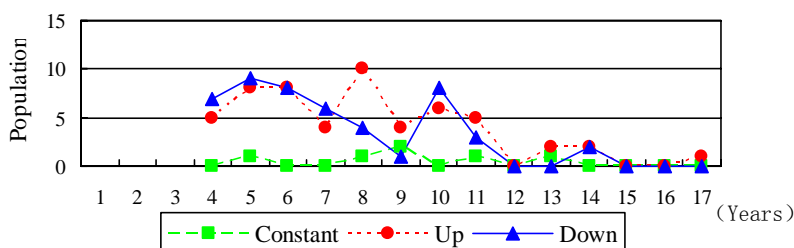


Figure 2 President's Tenure and University Ranking Change

8) Overseas experience. In the sample (See Table 4), 55 presidents in the ranking up university have 34 peoples once study, visits study or has worked in the overseas, in place drop university's 48 presidents in the ranking down university have 33 once study, visits study or has worked in the overseas. The majority presidents have overseas experience through data analysis. There have no obvious correlation between overseas experience and university ranking.

9) Academic achievement. In this paper, academic achievements include academic title, national projects, Number of Papers Published, Paper with University or Education. Because academic titles have great variety we only choose the academician from Chinese Academy of Sciences and Chinese Academy of Engineering. According to the analysis indicated that, between these factors and the school ranking does not have the very obvious influence.

#### 4 Conclusions

This paper using of the SPSS 16 software do correlation analysis between dominant indicators of university president and university ranking. The conclusions as follows:

In China, university presidents basically are a male. The national major part is the Han Nationality, is created by Chinese nationality's unique feature that main body nationality adds national minority. Above 80% presidents have doctor degree but the major have different, in which presidents who are engineering and science are majority. Partial presidents have academician's title, took office age of presidents generally between 40 years old to 60 years old. But generally speaking, these factors have not obvious influence to university power.

On the analysis result, graduation school and tenure have influence to university. Presidents graduate in work school has certain superiority to the manage school, although said transferred to a new post president from other places to be possible to bring the different management pattern and the development strategy, bring into the fresh blood to manages the university, but is not very stable. Chooses principal from the interior have two advantage, on the one hand, had in certain degree understanding to school actual situation, has advantage to implements own management mentality and the method, on the other hand, understand the management pattern of forward predecessor, can unify the school actual situation, to inherits and carries forward predecessor's school idea, carries on the adjustment to the improper place. President's tenure also has influence to the school. Some research indicated that, university president's tenure stability is advantageous to university president's idea practice and the policy execution. Like Harvard University, in more than 370 years history, only 26 presidents, average each president the tenure was above 10 years, in which Charles William Eliot as president for 40 years, James Bryant Conant for 20 years. Therefore safeguards president's tenure regarding a school development is extremely essential.

Consider the other factors. As a result of the globalization tendency, presidents have the overseas background more and more, the overseas is not the important influence to school ranking. The academic achievement reflect the president's academic level, it has certain help for president to manage school, but cannot merely carry on the appraisal from quantity.

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# A Probe into the Automated English Learning Administration Mode in Colleges

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**Abstract:** As graded English teaching mode is a prevalent buzzword nowadays, how to improve the learning efficiency of college School students is an urgent issue to be resolved. This essay takes advantage of the author's rich teaching experience to analysis current English teaching mode in colleges, and put forward a new way of classroom teaching management mode. The author thinks that English teaching in college aims not only to improve the students' language knowledge, but also it should cultivate students' interest in learning because interest is the premise of obtaining the best learning effect. It concludes English teaching in college should make good use of the utilities and equipment and further the reform to improve the students' learning autonomy. In the circumstance of graded teaching mode, English teaching in college must change from the "teacher-centered" class activities to "student-centered". Only when the students develop the autonomous learning ability can the English teaching in college be a success.

**Key words:** Graded English teaching; Management mode; Learning autonomy; Creation

## 1 Introduction

Nowadays, with our country attaches more importance to English teaching, graded English teaching mode is becoming the buzzword for students of different level in colleges. This is a new teaching mode as we teachers change our roles from one man's voice to Automated Instruction assisted by multimedia. More and more people think that we should give the students the freedom of study. Autonomous instruction means making the students the master of educational activities, which represents a more advanced teaching idea. Compared with the traditional teaching method, which focus too much on the passive teacher-to-students mode, it's obviously a great improvement. The new method will reform the traditional classroom teaching mode, trying to make it into more positive, active and colorful, which can widen the students' world view, expand the scope of their study and enrich their knowledge because the new method breaks the limitation of time and space to make the students participate in the teaching process, and at last to make the social perception of the interaction of students, teachers and the study environment become true.

## 2 Changes in Modern English Teaching in Colleges

According to the College English Curriculum Requirements in 2004, in combination with each college's position and their personnel training objective, a unified target is set up to cultivate the students' listening and speaking ability and improve their comprehensive English application ability. And there are three different levels of the requirements for college English learning: the lowest, the normal, and the highest. The teachers have different emphasis on different levels.

### 2.1 The definition of graded English teaching

The graded English teaching mode means organizing the teaching process according to the students' different English levels, which has become the trend of college English teaching reform. The traditional classes are reorganized into different levels, which break through the limit of majors and departments. Adopting the graded English teaching mode scientifically and reasonably is the safe guarantee of college English teaching which contributes most to improving teaching quality, optimizing the teaching staff, and boosting the students' autonomous leaning ability. We are creating a newly interactive classroom environment.

### 2.2 The change of teaching concept

Teachers, students and teaching material compose the basic factors of teaching link. Whether we must teach according to the material or the students, and how to deal with the relationship between these three factors is continuously the topic which we try to explore and examine. As we have more and more frequent contact with foreign countries, the traditional teaching methods are becoming more and more difficult to adapt to the development of the new era.

The teaching process is a process of interaction between the students and teachers. When the

teaching and learning adapt to each other, our higher English teaching can meet a success. In theory, students must adjust their learning strategies to the teachers' different kinds of teaching methods and the teachers must adopt various approaches to adapt to the students' difference in personality. As a matter of fact, there are many factors influencing English teaching in colleges, such as the society, the schools, the teachers, the students, and the syllabus and so on. In order to change the ineffective classroom teaching, we must fundamentally change the traditional teaching mode, change the teacher-centered classroom teaching environment to student-centered to make the students more independent and responsible for their own study.

### 3 The Management Mode in Colleges

The graded English teaching mode breaks the traditional rules of dividing classes. The students in one class may come from different departments and schools. So it's very scarce for the teachers to communicate with the student counselors, which makes it difficult to supervise the class. Even some teachers have no chances to know the names of their students. And from the second term, some students in level A will fall to level B; and so some students in level B advance into level A. The situation will cause some confusion in management. So that improving the academic management mode is vital to the success of graded English teaching.

#### 3.1 The students' management module

Because graded English teaching mode is very dynamic---students move in and out of different levels. We must make a list of all the students in each class and update the list as soon as possible. That is the first step to carry out the teaching mode. By knowing more about the students, teachers can adopt various kinds of materials and methods to help the students make progress.

Of course, some other information of students should also be contained in the list, such as their result in each semester, their main characters and the study status in the study groups, which is a information base of their whole learning process and gives support to their graded teaching mode, in which we must give more aid to the students on how to cultivate their autonomous learning ability and monitor their study process. (See Figure 1)

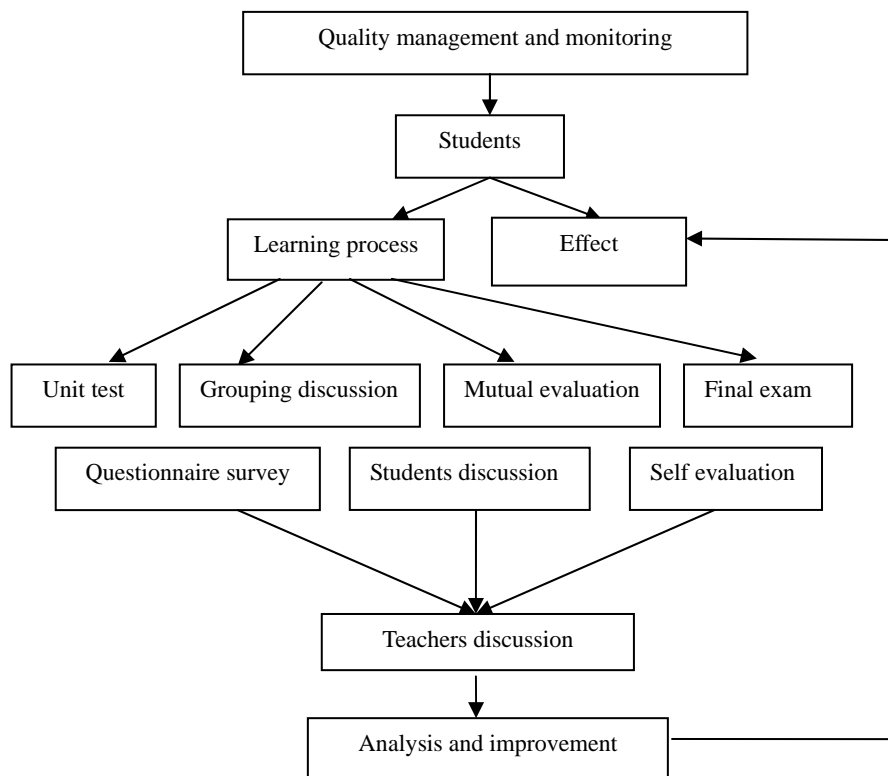


Figure 1 The Quality Management and Monitoring for Students

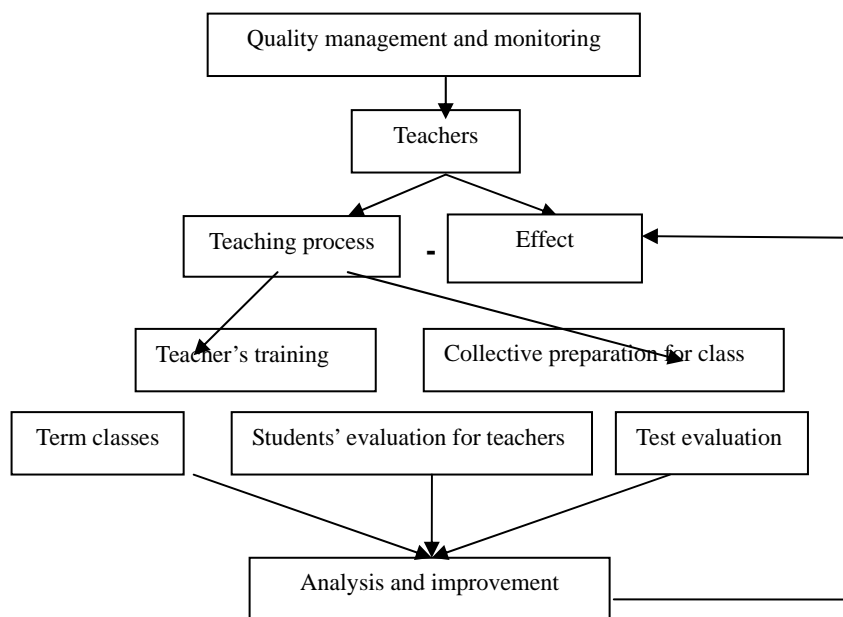
#### 3.2 The education administration management module

The education administration of graded teaching mode has something similar to that of traditional teaching mode and something different as well. The difference lies in graded teaching mode, is that the new education administration management focus on the student-centered environment, in which the modern management program can make it possible for the students to enroll study, seek information, choose curricula and even self test all by themselves. The school opens the electronic network station and provides different kind of information for students to browse or download. In this module, all the tasks are done by the students themselves which is very helpful to put in the idea that students are the master of their study and should be responsible for their own action in the school.

**3.3 The school teaching management module**

Teachers of high quality are essential to teaching performance. In the circumstance of graded English teaching, teaching staff plays a very important role in class activities. Because this mode is still new to some teachers, especially young teachers, the experienced teachers should be the teaching models. They can deal with teaching affairs by communicating with each other. Teachers know more about the teaching mode, the administration mode and their teaching target which will contribute great to the whole learning process.

The purpose of this management module is to guarantee that the target of quality teaching can be achieved smoothly. Firstly, centered on the curricular and individual students of different levels, graded teaching mode proposes the new management method of combining class management and curricular management and allows the students make autonomous learning under the direction of teachers. They can finish the course learning ahead of schedule or postpone the time of graduating; they can choose the same course even in the different grade. As the organization of the teaching, the mode doesn't stickle to the limit of classes and grade in which teachers can organize the class activities freely, so can the students make up their mind on what to study and how to achieve their goals. (See Figure 2)



**Figure 2 The Quality Management and Monitoring for Teachers**

**4 Ways of Classroom Managing to Improve English Teaching in Colleges**

In this circumstance of graded teaching mode, we teachers used various and original method to make the assignment more comfortably accepted by the students. In fact, there are four practical and critical parts in our project to encourage students' learning autonomy. They are grouping, information collecting, presenting and evaluating and commenting.

**4.1 Grouping**

Ho and Crookall (1995) argue that the teachers can help learners to refine their ideas about their responsibility for study and create an environment for them to practice their responsibility. It's believed that well-organized tasks can assist the learner autonomy in much the same way. Some measures were taken in the experiment to stimulate all the students to develop a habit of self-study.

In each class, the students were divided into several groups according to their sex and characters, with one in charge of the group. The purpose of grouping was to make the students share their ideas and communicate. When the students discussed the same topic share the same materials and supervise the learning process, they co-operated, influenced and stimulated each other. There were more interactions between the members. For example, by playing a role in a famous movie, they learned that they might be responsible for their own action. Their program can be a success only when they worked towards the same goal. In this process, the students start to know their roles in learning and switch from teacher-dependence to self-dependence. Their spirit of independence and cooperation is elevated. The less students rely on the teachers, the more their autonomous learning ability will be improved. Experiment showed that students were willing to participate in the grouping activities, through which they could learn from each other and make progress.

One point we must notice that autonomous learning doesn't mean individual learning by the students themselves but being responsible to their learning activities. They can get to know more about themselves through cooperating with others, and try to solve problems. As a result, grouping is an vital aspect of autonomous learning.

#### **4.2 Information collecting**

In this step, students are encouraged to seek information useful for them to present in the class or discuss with the class.

Before each activity, the teacher would make clear their assignments. Then the students must use all kinds of reference books to collect information such as encyclopedias, multimedia software and the internet. The students tried every means to search for the knowledge useful for their program. By information collecting, their motivation was exerted and most of them thought that now the teachers treated them as adults not babies. They started to get to know that learning means much more than just reading the textbooks. They even would make evaluation on the subject and the teaching methods, through which they would get to know that their jobs were respected by others and the teachers could know more about the students' interests and needs.

#### **4.3 Presenting**

In our teaching program, each student should make a presentation of any subject in English---a short story, an English joke or even some English puzzles. At this time they all became the master of the class. They employed pictures, maps, charts, and video shows to make all the class participate in the activity. The others were attracted by their performance and all their performance was graded through which they would be all stimulated to do their outmost to be the best one. In this part of activity, students got to know that self study was very important in learning English.

#### **4.4 Evaluating and commenting.**

In this step, we made the students first evaluate their own performance by comparing their actual work with what they expected. Students were encouraged to make note of their study process by using introspective method and retroactive method. Then their classmates would give them their views on the performance---the strengths and weakness. At last, of course, the teachers would summarize their individual work by giving them a point which would be taken into account in their final examination result.

The feedback from their peers was very valuable for the students to realize their language mistakes, complete with grammar errors and vocabulary misuse. In this step, students got to know more about their own study and start to consider how to make themselves more independent learners. Students were asked to write down their feelings of the study, including success and failure, and the reason analysis. Then after a particular period, the teachers gave them helps and suggestions for them to adjust. Because almost everything was done by the students themselves, which made them know that now they were their own masters, and they should not depend on the teachers that they would learn more about autonomous learning. Experiment indicated that students comprehended more clearly about their learning strategies, and about the significance of a continual evaluation of their study process and the study consequence. Without this recognition, the students would stick to their traditional ways of learning, that they would never be autonomous learners.

Besides, we gave the students different kinds of test to identify the effect of their learning progress in each month. And at the end of each term all the students used a one-level paper to participate in the final exam. And also in each term, we made a note of their result in online learning courses. At last we made comparison of the average scores of these students by using this mode and that of the students without using this mode. In order to support the experiment, findings and surveys are used to get more data. Even though the personalities of the students are different, we try to make the examination

objectively.

#### **4.5 The help of multimedia and internet technology**

College English teaching requires continually reforming its teaching concept and boldly adopting new teaching method. When held in the normal classroom, the class activities can be presented in pair works, group discussion and individual performance. In all these activities, without the question of being primary and secondary, the teachers and the students co-own and build the resources, and cooperate to solve the problems. In the class, teaching doesn't mean simplex knowledge teaching and input. The teachers have become the provider and designer of teaching material, and the monitor of the academic process as well. They are no longer the only authorities of knowledge and the students have their right to raise their own idea and views.

However, the success of graded English teaching mode owe mostly to the usage of multimedia and internet technology. Every one knows that the process of teaching has no standard rules. The academic programs done in multimedia classroom are even versatile and flexible.

The modern multimedia web education combines diagrams, pictures, texts, and videos into one form of teaching method. With the help of campus network, computers can provide internet backing for English teaching, which is very good at integration and powerful in interacting and rich in sources. So that the graded English teaching mode, which is based on multimedia and internet technology, not only can exert the advantage of network, but also make good use of the traditional teaching method, whose vantage is clear to seen. The teachers can make the best of its good features of convenience, flexibility and large carrying capacity to design suitable courseware which aims to repeatedly practice the main point in learning. At the same time, according to the teaching requirement, they can also organize the students to make discussions, presentations, debate and role playing to consolidate what they have learned, which can enormously stimulate the students' autonomous learning ability.

### **5 Conclusion**

The main aim of education is to empower learners' autonomy with the ability of learning how to learn. Students benefited a lot from the graded English teaching mode. They enhance the effect of learning. In becoming actively involved in the process of learning, the students set his or her own objectives and by working independently of the teachers both inside and outside the classroom, they realized a sense of autonomy in the environment of graded teaching mode. The students in this mode, who have become autonomous learners, will surely be a great asset to China because they have not only learned language skills but will also have developed the capacity to think and to take control of their own learning.

Learner autonomy does offer a challenge to both educators and the community. But this process will have been worthwhile in the long run. It's the time for teachers to sow the seeds of autonomy and cultivate a life-long habit of autonomous learning within the students. "Give a man fish, and you feed him for a day; teach him how to fish, and you feed him for a life time." Learning autonomy, and graded teaching mode, can play a vital role in ensuring that academic development goes well in our college teaching environment. And the mode should be sticked to as long as we study English.

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# Practice and Development of Construction Engineering Quality Insurance of China

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**Abstract:** The implementation of construction engineering quality insurance system can effectively take precautions against and reduce risks and protect the interests of related parties. Recently, the pilot work of the construction engineering quality insurance of China has been implemented nearly 5 years but yielded little. Based on the present situation of the pilot work, this paper analysis the problems and reasons of the construction engineering insurance system, puts forward solutions and concrete countermeasures from laws and regulations, insurance system, insurance consciousness, insurance products and other aspects, which promote the successful development of engineering quality insurance in our country.

**Keywords:** Construction engineering quality insurance; Pilot work; Risk management; Countermeasures

## 1 Introduction

Construction engineering quality insurance is a insurance that covers the loss of building owners caused by building structure defects or engineering quality accident in the certain period after the completion acceptance of the construction project, which the owners is the actual beneficiary and developers is the insurer. The implementation of construction engineering quality insurance can not only effectively take precautions against and reduce risks, protect the corpus rights of related parties, purify and perfect the construction market. It is founded by the French, then the UK, Singapore, Italy, Finland, Indonesia, Spain, Sweden, Canada and other countries gradually introduced and developed the operational mechanism. Through nearly two hundred years of development, it has become an internationally recognized construction engineering quality management system. At present, this insurance rate in the residential project in France has reached 100% and Japan, Britain and other developed countries have achieved over 90%<sup>[1]</sup>. In contrast with mature model of foreign countries, the development of construction engineering quality insurance in our country is being placed in the experimental unit stage which few insurance companies and few engineering projects involved this insurance, therefore, with the continuous improvement of the legal system, social supervision, enterprise self-discipline and other various segments, the introduction of quality insurance conditions in construction industry is gradually mature. This paper discuss the present situation of the pilot work of the construction engineering insurance system as a point penetration and fully puts forward solutions and concrete countermeasures, which contribute to the construction industry development and promote the transformation of government function and reach international practice at the same time.

## 2 The Present Situation of Implementation of the Construction Engineering Quality Insurance of China

### 2.1 Laws and regulations basis of the construction engineering quality insurance

For the construction engineering quality insurance, "construction law" promulgated in 1997 did not make explicit regulations, which Article 62 specifies that system of the warranty of quality shall be established for construction projects but now quality assurance system is widely used. 22th April, 2006, the latest revision "construction law" still not establishes the legal position of construction engineering quality insurance. "construction quality management regulations" Article 40 provides the lowest guarantee deadline for the construction project under normal use. In 2005, the Ministry of Construction and CIRC jointly issued "Principle of promoting construction engineering quality insurance", which proposed the basic framework of the system, made clear the types of engineering insurance, insurance project type and insured subject.

### 2.2 The pilot status of the construction engineering quality insurance

19th September, 2006, the pilot work of the construction engineering quality insurance by the Ministry of Construction and CIRC has been officially started, PICC takes the lead to launch new

products in Beijing, Shanghai and other 14 cities. Shanghai, Beijing, Xiamen, Shenzhen, Wuhan and other pilot cities formulate concrete measures in combination with its practices. For instance, Shanghai is exploring the co-applicant and co-insurance mechanism, Beijing implemented the engineering insurance universally in Olympic projects, Xiamen put forward the terms of the local branch offices and make some efforts in the insurance intermediary. 12th May, 2006, Shanghai Construction Administration and Shanghai Construction and Traffic Committee jointly issued "Principle of advancing risk management system pilot work in construction engineering", which make clear explanation of the construction engineering quality guarantee and insurance, Chongqing promulgated the "Principle of accelerating construction quality insurance system pilot work in construction engineering" (Exposure Draft), which propose the developers should joint with contractors to take the pilot work of the warranty of quality in construction stage. 10th October, 2007, Department of Construction of Jiangsu Province, Nanjing branch of PICC and Nanjing Jianye Urban Construction & Development Holdings Co., Ltd jointly held the release of the ceremony of Nanjing Yunhewan Garden District owner "insurance policy of residential quality guarantee", which the owner of the district has become the first national owner that obtain the insurance policy of residential quality guarantee.

Due to the greater risk of construction engineering quality insurance, its longer time for insurance, less data and no related ripe experience, there appears the situation like "government hot, insurance company cold" after "Principle" issued, although there are individual areas carry some advanced work, so far made no substantial progress.

### **3 Existing Problems of the Construction Engineering Quality Insurance of China**

At present, as a kind of economic means to reduce construction engineering quality risk, the construction engineering quality insurance in its implementation still exists some main problems in the following:

#### **3.1 No source of funding for the construction engineering quality insurance expenses**

In 2003, the Ministry of Construction and the Ministry of Finance jointly issued "the project cost components of the construction and installation", which incorporate the accident and casualty insurance into the budget thereof, but not include the construction engineering quality insurance expenses. In 2008, the revision of the "Specifications of Charging on Bill of Quantities of Construction Projects" make no provisions about the construction engineering quality insurance expenses, therefore, the construction engineering quality insurance expenses lack related laws and documents support.

#### **3.2 Demand shortage of construction market for the construction engineering quality insurance**

At present, China's 14 pilot cities have started to try out construction engineering quality insurance system. Since the reasons such as the lack of investment system, the imperfect market development, the flimsy engineering risk consciousness and claim consciousness of parties and construction engineering quality insurance expenses can't included in the cost of construction enterprise, each parties have not recognized clearly the importance and necessity of the construction engineering quality insurance, which leads to the obviously demand shortage of construction market for the construction engineering quality insurance.

#### **3.3 Unformed market of engineering quality insurer**

As a newly emerging thing, engineering quality insurance business is still in the initial stage, which has many imperfections. It is the high technical type of insurance that if a certain part of the risk management is inadequate, the insurance company may lose money. Due to the general lack of insurance company professional technical force to have effectively risk monitoring and management at present, and the final business risk should assume to his own, many new management problems that are different from the traditional business increase the difficulties to carry out this business, therefore, the market of engineering quality insurer has not formed currently.

### **4 Cause Analysis of the Construction Engineering Quality Insurance of China**

#### **4.1 Inadequate laws and regulations**

At present, construction engineering quality insurance are not explicitly stipulated in "construction law", "construction quality management regulations" and other relevant laws and regulations. "Principle of promoting construction engineering quality insurance" proposed the basic framework of the system but has no legal force. 14 pilot cities also issue relevant official documents. Currently Security Law, Assurance Law, Bidding law and other laws have involved the construction engineering quality insurance, which have become its legal basis, but most of them set the principled request from the point



of view of management that are lack the systematization and integrality. In addition, existing laws and regulations of engineering insurance have not mentioned supporting measures according to the engineering characteristics which leads to the shortage of maneuverability of engineering insurance in practice. The explanation on Security Law issued by the Supreme Court which has 134 articles did not refer to the engineering insurance. The multi-type compulsory insurance is also lack of legal support recently. The administrative departments have not finish its conversion of function, which the inertial thinking of using administrative measure to intervene in markets still play a role.

#### **4.2 Ambiguous position of insurance system**

The frame system of construction engineering quality insurance is not a single insurance but a set of complete system, which mainly includes two aspects: one is the defect insurance of the building itself, the other is each contractor's liability insurance. Only these two types of insurance complement each other can form the complete frame system of construction engineering quality insurance. At present its positioning in some insurance companies in our country is not clear, which confuse the defect insurance with the liability insurance, therefore, its primary proportion of the frame system of construction engineering quality insurance is the quality defects. In addition, the frame system of it emphasizes the usage of the construction process which concentrates more on the construction engineering quality defect insurance than the construction engineering quality liability insurance<sup>[2]</sup>. Take the pilot work of Shanghai in 2006 for instance, the participant parts only can insure contractors all risks insurance, erection all risks insurance, personal accident insurance and the construction quality warranty insurance, therefore, insurance company lose the right of subrogation on all contractors once the claim occurs.

#### **4.3 Flimsy risk awareness of the insured**

At present, construction investment of our country are mainly from government financial investment, private capital investment is relatively less, which leads to the lack of investment system of construction engineering field and the flimsy awareness of engineering risk in companies, therefore it is often the government that assume most of responsibilities once appears serious problems in the end. As the requestors in insurance market, most of the insured regard insurance as an extraordinary expenditure, though the premium is less compared with quality assurance system. Once purchase it, the possibility to take it back is little, which should not cause the companies tend to buy the insurance.

#### **4.4 Slow development of insurance companies and over harsh design of insurance products**

Insurance companies are motivated by their own interests as suppliers, when they enter into a contract, they begin to take care of every step, analyzes the possible cause of the accident and suggest countermeasures to eliminate accidents in the bud as much as possible<sup>[3]</sup>. These all need professional technology and knowledge, and relevant professionals of insurance companies in our country that familiar with engineering risk and understand insurance business presently are very little.

At present, according to the relevant provisions of the Ministry of Construction, China is planning to institute construction engineering quality insurance system for 10 years, the concrete content of it are listed as follows: the contractor is responsible for maintenance and assume related expenses unconditionally in the first year(if the contractor failures, the responsibility of maintenance will transfer to the insurance company that the owner insured); from the second years to the tenth year, the insurance company will compensate firstly when the defects of building structure and function appears, then it will be subjected to related parties' responsibility of subrogation.

Currently the construction engineering quality insurance products that developed in pilot cities are basically belong to Shanghai model, which implement construction engineering risk management system in accordance with the principle of "insure jointly, guarantee jointly, control jointly and mutual restriction" and has the three features in the following: 1) developers take the lead to joint with designers and contractors to purchase the construction insurance; 2) the guarantee community that consists of engineering quality test institution, several insurance companies and its entrusted institution of risk management have security and quality risk management, ensure the engineering quality and safety together and claim in time when accidents happens in accordance with the contract. 3) combining with Contractors All Risks Insurance, Erection all risks Insurance, Personal Accident Insurance and the construction quality warranty insurance to form construction engineering insurance. The starting point of the design is to have risk control and management for the whole course and in all directions, avoid over-insurance in some sections and leaving out some insurance in other sections, therefore reduce insurance transaction cost. But this type of complex product design often becomes the obstacle to promote construction engineering quality insurance at the same time. Under the circumstances of the view that developers consider the construction engineering quality insurance will increase the private cost, over harsh conditions to make it effective become to be the fact that rewards inferiority and

punishes superiority, which the engineering project owned good quality and performance must insure the construction engineering quality insurance but the bad quality and performance of it are exempt from the insurance liability and cost.

#### **4.5 Imperfect market development of engineering insurance**

The smooth implementation of the construction engineering quality insurance system needs a mature market environment, which the matched intermediary service organizations such as quality inspection institution, quality monitoring institution, risk assessment institution are indispensable, they can not only determine to effect insurance or not for insurance company but also provide quality accident assessment service, which such market in our country is immature. From the viewpoint of function, our country's current construction engineering quality assurance system includes the drawing appraisal agency, government supervision department, the supervision organization employed by the developers, and each of them cannot undertake independently all functions of quality inspection institutions; From the viewpoint of independence, the risk management expenses of the construction should be paid by developers and entrusted by the insurance company, but actually the expenses is entrusted and paid by the developers directly that quality inspection institutions (supervision organization) should act in accordance with the intention of the developers, which incurs new asymmetry information. In addition, the asymmetry information also results in other problems such as the qualification of engineering quality; analyzing the quality accident qualitative and quantitatively; defining the insurance liability and scope of each parties and so on.

The insurance rate also needs further discussion to determine. Currently statistical data related to quality insurance in our country is deficient and closed, quality insurance rate is hard to rationally defined, and the pilot project uses the insurance rate of foreign countries for reference, but the proof of the pudding is in the eating, which its rationality directly related to the insurance company's profits and losses. In the initial stage of quality insurance development in France and Australia, excessively low insurance rates results in the general business deficit and insurance company breakdowns, but high rate is difficult to accept for insurers. Therefore, each insurance companies are very cautious and do not take positive attitude though they has realized this new business area and broad prospect.

### **5 Establish and Improve the Thought of Construction Engineering Quality Insurance in Our Country**

Currently under the system of the warranty of quality, contractors should pay the quality deposits to developers of 5%~10% of the contract price and it will be refunded only in the condition of good quality and no complaints three years later, meanwhile developers submit housing quality guarantee to the owners. Since there exists the difficulties of defining quality standards, the scope of quality problems and the responsibility of all parties in practice, the contractor often can't get the quality deposits back on time, by which legitimate interests of small business owners is hard to guaranteed that if quality problems of buildings appears in the reasonable lifespan, developers often shift responsibility for excuses such as bankruptcy or dissolution of contractors<sup>[4]</sup>.

After introducing the construction engineering quality insurance system, developers should pay the quality insurance according to a certain rate to the insurance company with the base of the expected housing sales (deducting the land-transferring fees) and offer insurance certificates for all the owners who have acquired property ownership certificates. If the buildings developed by insurers damaged because of quality accident under normal conditions, the owners can directly claim with the insurance companies for compensation to protect its interests effectively and the insurance companies will take effective measures of having whole process quality control in engineering design and construction to ensure the engineering quality to reduce compensation.

### **6 Establishment and Improvement of Construction Engineering Quality Insurance Measures**

The pilot work of the engineering quality insurance and its nationwide promotion requires common efforts of the government, the enterprises and the social sectors, which the measures to improve can from the following respects:

1) Establishing and improving relevant laws and regulations of construction engineering quality insurance system

Firstly "construction law" and "construction quality management regulations" and other relevant laws and regulations should clearly define the concept of construction engineering quality insurance

system and entrust its mandatory requirements. Secondly we should clarify engineering quality responsibilities of prospecting units, design units and supervisory units, drawing appraisal agency, quality inspection institution and other participants, strengthen their quality consciousness and risk awareness to reduce risks through insurance and maintain the order of construction market.

2) Carrying the pilot work of construction engineering quality insurance actively and reliably

Our 14 pilot cities should make scientific and rational insurance clauses and normative contract terms, set up corresponding supporting institutions and carry each aspects of construction engineering quality insurance work actively and reliably to promote nationwide, in this process we should give priority to the communications among cities, discuss and exchange views in representative and common problems to accumulate experiences and create conditions of the full implementation of the construction engineering quality insurance system in our country.

3) Improving the level of insurance companies

Insurance companies should explore internal management model of new business gradually, set up the new management process and analysis statistical indicator system and explore collaborative approach with the third parties, hence establishing marketing and effective risk management system of the engineering quality and accelerate the training of the compound talents that familiar with engineering risk and understand insurance business.

Insurance products should be simplified to enhance its flexibility and adaptability in order to reduce the barriers of engineering quality insurance system development. Firstly we should separate the engineering quality insurance from engineering insurance and construction personal accident insurance to make them mutual independence insurances, therefore, insurers combine more types of insurances in the light of the actual situation and insurance companies not only ensure the flexibility of insurance products but also saves a great deal of trouble of purchasing and combining more types of insurances for developers who have multiple demands so as to exploit its scale effect and reduce insurance transaction cost<sup>[5]</sup>. Secondly we should dissolve co-applicant and co-insurance, that is, developers select the insurance company that satisfies certain qualifications to purchase engineering quality insurance, contractors all risks insurance and erection all risks insurance as the single insurer, which the problem of insurance premium sharing are negotiated by developers and contractors when signing the construction project contract and the insurance company entrust other institutions such as supervision institution of risk management, engineering quality test institution and reinsurance company to participate the engineering risk management together, hence enhancing the flexibility and adaptability of the engineering quality insurance and promote the development of the insurance market.

4) Establishing scientific and rational mechanism of premium rate of construction engineering quality

Insurance companies should follow the principle of "appropriateness, fairness, rationality, stability, flexibility, encouraging caustic preventing work", attach importance to the lever of rate and promote engineering quality awareness and action of the insured. Differential rate and floating rate should be gradually executed in accordance with the project scale, complexity of technology, performance of contractor, the level of project management and so on to decide insurance rate of each project, meanwhile discounted rate system without compensation can also be established<sup>[6]</sup>. We should try to avoid the phenomenon of the contractor of "bad money drives out good" because of excessively high premium and the phenomenon of high compensation cost because of low premium of insurance company. In addition, we should establish the credit file of companies and personnel professional qualifications to pursue credit evaluation mechanism of the principle of "openness, impartiality, fairness", which the social intermediary organization assess credit rating, establish engineering credit system and regulating the construction market. Meanwhile we should carry out extensive international exchanges and learn the successful experience from foreign countries to establish the construction engineering quality insurance system that is consistent with international practice and Chinese characteristics considering Chinese status.

## 7 Conclusion

The promotion of the construction engineering quality insurance system is a significant reform of construction engineering quality management in our country, which can relieve the pressure of the government, transfer the subject risks of responsibility of each construction parties, reduce business risks of construction enterprises and protect the legal interests of the public. This paper analysis and summarize this insurance system from multiple perspectives: laws and regulations, insurance system

and mechanism, insurance consciousness, insurance products and market, which build a macro guidance in directing the construction engineering quality insurance development, at the same time, it has not deeply analysis the certain part among the perspectives that needs further study in the future to make operable and practical.

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## Research on Panic Purchase's Behavior Mechanism\*

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**Abstract:** Panic purchase always causes serious influence to social stability; economic order; enterprise management and consumer psychology, and the degree of its frequency and impact are rising. So the research of its behavior mechanism is of very important practical significance. This paper first defined panic purchase and described its characteristics. Secondly, we put forward the evolution mechanism of the panic purchase, including incentive, information dissemination and diffusion, panic purchase happen, reaction of government and the media and subsidy. Finally, the paper analyzed the characteristics of its evolution process.

**Key words:** Panic purchase; Information spreading; Behavior mechanism; Evolution process

### 1 Introduction

Over the past decade, there had been many panic purchases occurred along with many crisis events, the most representative including food and drug panic purchase during the SARS period in 2003, the water panic purchase caused by water pollution at Harbin in 2005, the garlic snapping during the H1N1 influenza virus period in 2009; the salt snapping caused by Japan nuclear radiation in 2011. Those panic purchases' behavior caused serious influence to social stability, economic order, enterprise management and consumer psychology. Panic purchase turned the basic balance of supply and demand to the great contradiction between supply and demand at a short time; promoted product's prices rising deformity; influenced of the economic expectations, decision and future behavior; distorted the market allocation of resources and brought hidden trouble to future market supply and demand balance. Panic purchases cause damage to the market order, make the market failure, and bring the improvement of transaction costs. So the research of panic purchase behavior mechanism can provide theory for governments and enterprises to prevention and control of panic purchases, which has very important practical significance.

### 2 Panic Purchases Definition and Feature Analysis

#### 2.1 Panic purchases definition

Rosenthal defined the emergency event as: it is event that causes serious threats to basic values of social system and behavior framework, must make the critical decision in the timeliness and uncertainty strong conditions. Legislation research project(2002) points out that public emergencies generally refers to events happen all of a sudden that has caused or may have significant threat and damage to national security and legal system, social security and public order, citizens' lives and property safety and caused great casualties and property losses and social influence. Thomas A.Glass (2002) points out that panic purchase is the public's self-presentation behavior when face the terrorism, using the terrorist attacks in the United States as background. Chunlei Fan(2003) believes panic purchases behavior is a kind of automatic reaction in crisis situation from the point of view of psychological behavior. Zhihao Xu defined the panic purchase as a kind of irrational behavior set. Duoyong Sun(2007) thought panic purchase is a flock irrational behavior based on imitation of infection. Honggang Tian(2011) thinks panic purchases is an group insensible market behavior that consumers buy a large number of product more than short-term demand as they perceived expected possible disasters, commodity prices or shortage of such circumstances. Xin Zhou(2011) indicated panic purchases is groups spontaneous irrational buying behavior because of worrying about the price. According to the literature of recent research and analyses and studies on panic purchases events, we defined panic purchases as group's abnormal purchase behavior at an uncertainty, incidental and panic situation caused by natural disasters or social events.

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### 2.2 The characteristic analysis of panic purchases

On the basis of summarizes and analyses about panic purchases happened nearly ten years, we can see that panic purchases has significant features includes uncertainty, incidental, panic, and abnormal buy and concentration features. Uncertainty is to point to the happen time, place, scale and influence scope, the cause, development direction and change trend is not clear about panic purchases, which can't cognate clearly in a short time. That is panic purchases' whole process is full of uncertainty from induced reason to the manifestation of the time, and then to the development of the event and the end, it is difficult for people to grasp and control the whole process accurately.

Incidental is point to that there is no obvious signs before panic purchases happen, especially they won't have long transition period, and often can not be expected.

Panic is point to the group who can't hold accurate information effectively often taking part in the panic purchases; they often feel not in the state and worried, feel pressure and worry to the thing. Because the events that caused panic purchases often have threats to the life safety or the property security or even to the social environment, the state must cause psychological pressure to the group, making them fear and rush to buy.

Abnormal buying is refers to a lot of people rush to buy some goods that exceed to their short-term demands, which is a kind of group behavior that not sensible. They buy those goods abundantly in order to placate the panic psychology and increased sense of security.

Concentration is mainly manifested in the time, people and product; it is a large group people at the same time on the purchase of the same goods. Only the number of people at the same time purchase the same goods can form the concept of panic purchase.

### 3 Panic Purchase Evolution Mechanism

Through research and analysis on panic purchase happened in SARS period, water pollution, H1N1 influenza virus period and Japan nuclear radiation, with reference related literature. We sum up panic purchase evolution mechanism mainly divided into the following several steps. (As shown in figure 1)

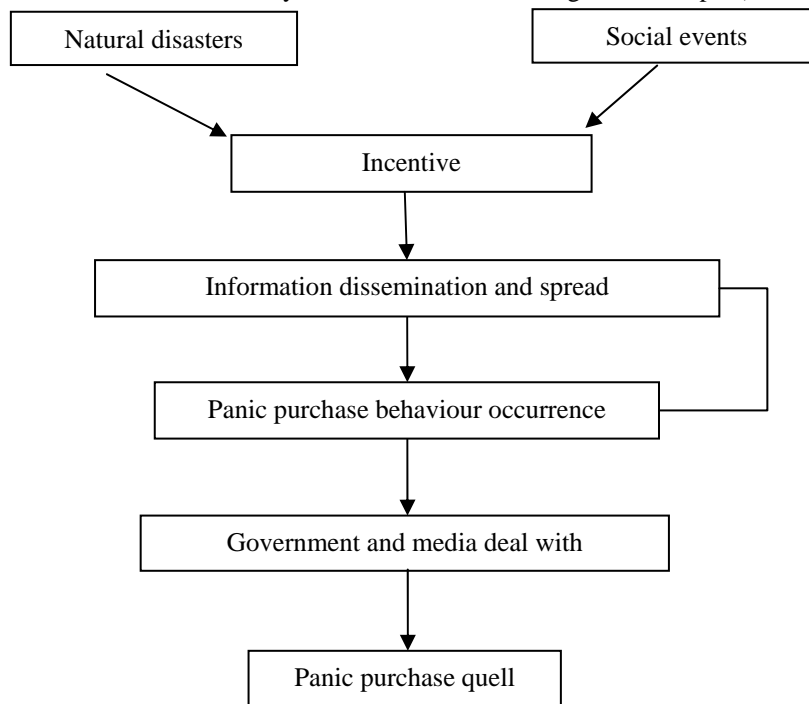


Figure 1 Panic Purchase Evolution Mechanism

(1)Incentive. Panic purchase always happened on the background of particular incident, we call it incentive. The major reason that caused panic purchase concludes natural disasters and social events. SARS, H1N1 influenza virus and and Japan nuclear radiation belong to natural disasters, while water pollution belong to social events. The goods people rush to buy always the daily use goods that have direct relationship with those disasters.

(2)Information dissemination and spread. When natural disasters or social events happened, people

perceived the danger and feel threatened. Information dissemination and spread play an important role at this time. The major methods are interpersonal communication, mass media and network. We can see the information transmission path is interpersonal communication (relatives and friends mouth transmission—phone—short messages—communication software)--mass communication (newspapers-news site—TV).

This propagation path has very high efficiency, and high spread speed. There have social capital and social trust and additional value translate when information translate through interpersonal communication network, which enhanced credibility and effect of information transmission, especially emergence of mobile terminal represented by mobile phone and tiny media represented by blog. This transmission is real-time, and has the ability to translate abundantly, which is a challenge to the modern social management.

(3) Panic purchase behavior occurrence. Due to the change of environment around and the spread of information and spread, people start to have fuzzy understanding of the present situation, and have the pressure and panic in psychological. At this time a small part of people man began to take part in panic purchase. More and more people involved in as information continued to spread, then formed the scale gradually. It caused adverse effect to market and social and made the social status to change. Some events caused by panic purchase happened, media also report trickily, which translate the information indeed.

(4) Government and media deal with. The government began to take certain measures when panic purchase developed to certain period development, and media began to report some news to maintain market and social order. The government began to stage some relevant policy to curb panic purchase phenomenon. At this time the government's main measures are: governments at all levels to take advantage of all media channels to report right information about the crisis, functional department also take some measures to control the market.

(5) Panic purchase quells. When the information about panic purchase appraised fairly by the government and the media, the government takes measures to make group's panic psychology be dissolved. People no longer feel threatened and pressure and have correct understanding on this panic purchase event. so their irrational behaviors reduced and they won't participate in the panic purchase. Market and social order restored to smooth state.

#### 4 Panic Purchase Evolution Characteristics

We also can be concluded the development trend and evolution characteristics of panic purchase process as shown in figure 2. we can serve the horizontal axis as time axis and the vertical axis are: the information dissemination; participation of panic purchase; quantity of panic purchase and the spread of panic purchase goods.

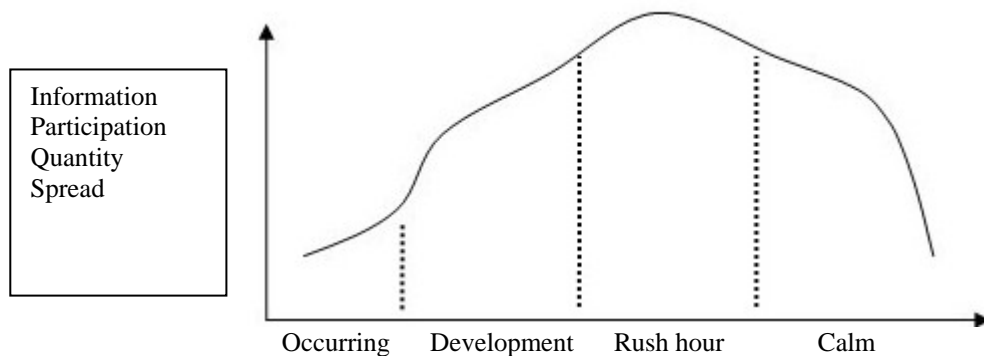


Figure 2 Panic Purchase Development Tendency

First, it is occurring stage. At this time information began to spread, but the speed is low and the quantity of information is small. Someone began to purchase goods exceed to their daily use at a small scale, but the quantity is small and the kind is single. It is not form great impact. Rarely people participate in the panic purchase at this time.

Second is development. In this period, information is expanding constantly through media and internet and human relations. They are developed either from the information channel or the amount of information transmission. The number of people takes part in panic purchase continuously increased,

and the growing speed is fast. The amount of commodity they purchased also present the quickly increasing, its growth rate is the fastest in the entire process. The kind of goods they snapped spread constantly at this stage and extends to many other goods.

Third is rush hour. In this period, information transmission scope, participation, quantity of panic purchase and the degree of good spread all go to the maximum, which is summit of the whole process. It is the period that causes the social harm. So it is the key period of panic purchase. The scope and extend of panic purchase reach to the highest point of the process.

The last is calm period. As the government and related departments deny the authenticity, group begin to understand the truth and come to their senses gradually. They will no longer participate in panic purchase. This period information transmission still continues, but the information is correct. People still buy product they need. Spread of goods recession sharply.

Thus, we can see, the earlier the government began to interfere, the shorter panic purchase last. That means if government interfere at the left of the curve, the damage to the society will be reduced. The media should play the positive role in the occurring stage and development stage and should guide people purchase rationally. The media should not report blindly. The peak of rush hour is decided by media and the government, the two sides have to work together to control the panic purchase effectively.

## 5 Conclusion

The paper concludes the behavior mechanism and development tendency of panic purchase and analysis their characteristics. The result can be used to control panic purchase. The future research can focus on measures to every stage.

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## AHP-Based on Evaluation System of Bilingual Teaching Construct: A Case Study in Yangtze University

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**Abstract:** There are lots of research achievements of bilingual teaching at present. But bilingual teaching is still in an exploration stage whose evaluation system and monitoring system need to be completed. Based on the construction of evaluation system of bilingual teaching in Yangtze University, the study adopts qualitative and quantitative method. It constructs an overall indicator of evaluation system of bilingual teaching using AHP and investigates the current situation of bilingual teaching of liberal arts, science and engineering. By comparing the teaching quality of class which proceeds bilingual teaching with class from the same major who does not conduct it, the study analyzes the advantages and disadvantages of bilingual teaching in Yangtze University and constructs a framework of bilingual teaching evaluation system which is used to evaluate the quality of bilingual teaching effectively and scientifically. It also provides a practical theoretical direction for improving the quality of bilingual teaching in Yangtze University and other colleges.

**Key words:** Bilingual teaching; Evaluation system; AHP

### 1 Introduction

Bilingual education is a major move of educational reform in higher education. In 2001, documents issued by the Ministry of Education require that universities and colleges practice bilingual courses (i.e. using Chinese and English) in various academic disciplines. There are lots of research papers about bilingual teaching since then, and it becomes a hot issue in the academic circle.

In general, the research on bilingual education in China may be roughly classified into five major types: 1) introducing the foreign bilingual education theories and models; 2) making comparison and contrast between bilingual education in China; 3) borrowing useful theoretical and practical experiences from foreign bilingual education to improve Chinese bilingual education; 4) analyzing the problems existing in Chinese bilingual education and providing countermeasures or even new teaching models 5) studies on the bilingual teachers qualities. The difficulties faced in the practice of bilingual teaching in colleges make all the colleges to realize that it is urgent to establish an effective evaluation system of bilingual teaching quality in colleges.

As the quality of teaching has ambiguity, higher education evaluation theory holds that served as a tool, scientific evaluation plays a significant role in the management and monitor of teaching quality in order to judge and balance teaching quality combining with adjustment and control. American operational research experts A. L. Saaty put forward Analytic Hierarchy Process (AHP), a decision-making analysis method combining quantitative and qualitative, in 1970s. The basic idea of AHP is to divide complex problems into several factors and group these factors into well-organized hierarchical structure according to their dominance relations. Through pairing comparison, the relative importance of each factor can be confirmed and then judge and decide the final sequence of the relative importance of the decision.

Constructing evaluation system of bilingual teaching quality of common colleges through AHP is to have an overall scientific evaluation of bilingual teaching quality, so that we can find out the problems, and based on the analyzing the problems, think about measures and then improve the bilingual teaching quality.

### 2 Constructing the Framework of Bilingual Teaching Evaluation System

The framework of college bilingual teaching evaluation system mainly relates to the quality of the various aspects of bilingual teaching and the construction and execution of the teaching rules and regulations in its monitoring system. It includes two aspects: the establishment of the bilingual teaching evaluation system and the establishment of the monitoring system to guarantee the normal operation of the former system. To establish the above systems, the following steps are supposed to be implemented.

#### (1) Step One

The first step is “to establish standards”. It is also a process to make plans. The “standard” is a set of metric ruler, which can be regarded as the reference system to assess the effects. The standard can be determined through a variety of ways, but on the whole it is derived from empirical investigation.

#### (2) Step Two

The second step is that the management monitors the effectiveness of bilingual teaching, and establishes measuring point of teaching effectiveness to ensure it reaches the standard required. Ways are included personal observation, written or oral report of the teaching staff, the report of the automated information system, testing, test, and sample surveys

(3) Step Three

The third step is to compare the actual teaching effectiveness and preset standards, and to make an analysis of its deviations.

(4) The Final Step

The fourth step is to take corrective measures when necessary (Liu Chun, 2004).

Analytic hierarchy process (AHP) is used to establish a comprehensive index of bilingual teaching quality assessment. By comparing the composite indicators, the priorities to improve bilingual teaching quality in the layer focused on measures can be obtained. Then decisions can be made.

The effectiveness of the monitoring system is based on three premises. The first premise is the effective management of the college evaluation institutions. The second one is the effective supervision of the bilingual teaching. The third one is the establishment of an effective rules and regulations. The following are steps to operate the monitoring system: establishing a centre of bilingual teaching for policy and supervision --- setting monitoring objectives and monitoring standards --- implementing and monitoring bilingual teaching --- collecting information about bilingual teaching --- comparing implementation effects and monitoring standards --- analyzing reasons and taking measures --- conforming to the standards of bilingual teaching.

The quality of teaching is affected by the quality of students, the quality of the teaching process and the quality of teachers. So the internal factors, such as teachers' professionalism, students' quality, teaching conditions and teaching management, are monitored for teaching quality. The monitoring of teaching quality aims to coordinate, evaluate and control these factors and to establish a smooth feedback network, thereby creating and maintaining a pleasant learning environment and ensuring the best teaching results. In other words, by combining the qualitative and quantitative analysis, it is necessary to construct the evaluation system of bilingual teaching, which ensures the steady improvement of teaching quality.

### 3 Practice of the Construction of Bilingual Teaching Evaluation System

It is a case study on bilingual teaching of Yangtze University. The study covers all the majors which implements bilingual teaching in Yangtze University, including liberal arts, science and engineering. Besides, students and teachers are chosen as the subjects of the study.

#### 3.1 Practices in Yangtze University

First of all, a standard of bilingual teaching quality and the first-class indicator of monitoring system are established through questionnaires. Based on the first-class indicator, the second-class indicator is established according to the specific items in questionnaires. Then, a key "observation point" of standard of bilingual teaching quality can be got through a further detailing of the questionnaire. Last, the third-class indicator can be established on the basis of the second-class indicator and the evaluation standard of bilingual teaching quality of Yangtze University is formulated. (See Table 1)

**Table 1 Chart of Evaluation of Bilingual Teaching Quality of Yangtze University**

Items	Evaluation Items
1	Teachers should be the paragon of virtue with earnest and serious working attitudes.
2	Teachers should make enough preparations and are familiar with teaching contents, which are advanced and arranged appropriate.
3	Key points of teaching contents must be emphasized with clear and informative contents.
4	Teaching contents can be taught clearly by both Chinese and English.
5	A good combination of Chinese and English teaching. Teachers need to use English to teach more frequently trying to reach 50% of the whole courses.
6	Multimedia is mainly based on English contents with Chinese notes of some key points. The blackboard writing should be clear and is arranged reasonable. Multimedia and blackboard writing are mutual complementation.
7	Various teaching methods can be adopted to have mutual interaction with students, inspire students to think and improve students' application ability of English.
8	Provide students with English teaching materials and copies of teachers' courseware.
9	Guide students' preview and reading of foreign teaching materials effectively.
10	The class is arranged orderly with a good teaching effect.

The second step of the study is that supervisors need to attend all 80-course lectures, which start bilingual teaching and monitor the effectiveness of bilingual teaching. In addition, supervisors have to evaluate teachers' teaching design, the control of teaching contents, bilingual expression, teaching methods and teachers' ability of teaching media, arrangement of classes, control and regulation of the class and cultivation of students' autonomous learning, etc. Last, supervisors need to give these feedbacks to teachers and teaching management departments and establish the evaluation standard of exam checking of bilingual teaching of Yangtze University (See table 2).

**Table 2 Chart of Evaluation of Bilingual Teaching Quality of Yangtze University**

<b>Evaluation Indicator</b>	<b>Num.</b>	<b>Evaluation Items</b>
<b>Design of paper</b>	1	Exam content fits the outline and has a wide coverage with proper difficulty level.
	2	Structure of exam is reasonable and rich which is no less than 4 types.
	3	Exam combines two types, i.e. A and B, which are not the same.
	4	Both Chinese and English, each of which is almost 50%, design the contents.
	5	The contents, which needed to be answered by students in English, cannot less than 50%.
	6	The standard of grading is scientific, reasonable and normative.
<b>Quality of paper</b>	7	The form of paper is norm without any mistakes.
<b>Marking of paper</b>	8	It is strict during the marking without misjudgment and missing items.
	9	Calculation of score is accurate and the sign of exam marker is standard.
	10	The analysis of test is scientific and reasonable.

The third step of the study is to combine the records of different lessons, and to know the real situation of the bilingual teaching in the Yangtze university through making questionnaire and making comparison of the pretest and post test, and also comparing the teaching quality of the same major by dividing the students into two groups, one is using the way of bilingual teaching, the other is not. The disadvantage and advantage of the bilingual teaching in the Yangtze University is out of the comparison of the real teaching result and the teaching plan, which is made before the class is teaching.

The key point is to study the relation between the bilingual teaching quality and the teaching of the teachers, the bilingual teaching quality and the initiative learning of the student. Thus, there design two set of questionnaires of the bilingual teaching investment of the undergraduate in the Yangtze university, one is for the teachers, the other is for the students, which includes contents of the bilingual teaching quality, the location of the bilingual teaching, the bilingual teaching course and the teaching text, the teaching management and the bilingual teaching quality, the way of making text and teaching quality, courses that are suitable for the bilingual teaching, the expectation from the students on the bilingual teaching, the factors that are influencing the bilingual teaching and learning as well as the reflection about the teaching.

There are 15 teachers and 313 students who are taken the questionnaire. And the result of the investment shows that:

(1)From the perspective of the language ability, the 15 teachers are all postgraduate, in which there are 5 PhD, which is 33% of the total. And there are 50% teachers participates the pre-class language training, they also have overseas learning experience. 60% of them have taught English. 80% of them teach bilingual class. Thus, the level of the teacher is high and they are with well experience of teaching. Although some of the teachers has little problems in pronunciation. However, from the students' point of view, the tone is not quick affecting the teaching result. Thus, it is proper to encourage the teacher to reduce the language anxiety.

(2)The problem of English teaching materials is still serious. Although the foreign original texts are rich in content and comprehensive in the knowledge structure is system, but there is still difference in education system in our country. And because of the differences in disciplines, curriculum, grade and the students' English level, it makes it difficult to choose suitable bilingual textbooks. Therefore, we should strengthen the bilingual textbooks construction and encourage choosing and writing practical teaching materials that have advanced international level and close to the Chinese teaching syllabus and the students.

(3) Now the 80 bilingual courses we offered include both professional courses both optimal courses, and students are from different levels from junior college students to undergraduates. The scope of opening bilingual courses level is too large, so the high-quality resources shall be allocated properly. Bilingual teaching put forward higher request to teachers and students, teachers and students are faced with double tests of both professional level and ability of English, so the offer level should not be too big.

(4) The evaluation and appraisal system are separated. When attended the courses in the assessment of the new curriculum review opening, the teachers presented lively and interesting PPT and well-organized content. But in actual teaching, especially in the case of no class supervision, the teachers use Chinese to teach and that did not reflect the characteristics of the bilingual teaching.

### **3.2 Reasons for measuring standards**

The research in step 4 is to analyze reason to take measures-up to standards.

Compare the practical teaching effect with the prescribed standards to analyze the bilingual teaching advantages and disadvantages in concrete implementation in Yangtze University. The experts should listen to lectures, and so do the teachers who undertake bilingual courses. The evaluation should be steered by students to teachers.

Formed a new evaluation group of academic experts to evaluate the bilingual class qualification of course evaluation system, bilingual teaching quality evaluation standard, implementation of bilingual teaching process monitoring and the experts' attending to lectures system, collection of bilingual teaching effect of classroom teaching feedback system, comparative evaluation standards and implementation effect exam assessment system, and review system of analysis check reason to take measures of teaching qualification. In this way, the overall framework of bilingual teaching quality standards and monitoring system can be completely constructed.

## **4 Conclusion**

It is a significant measure to construct the standard and monitor system of the bilingual teaching quality in common colleges. By adopting qualitative and quantitative research combining with AHP, the overall index of the bilingual teaching quality evaluation can be established and then we can make comparisons in order to know the real situation of the bilingual teaching. Thus, that constructing an evaluation system of bilingual teaching quality provides a practical theoretical instruction for evaluating bilingual teaching quality scientifically and efficiently and improving the quality of bilingual teaching in Yangtze University.

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# The Empirical Research on Relationship Between Fixed Assets Investment and Economic Growth

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**Abstract:** Quantitative analysis is based on econometric model. The model use GDP and kinds of fixed assets investment is constructed and data in 1985-2010 was selected for empirical analysis, Multiple linear regression models in which GDP was dependent variables and other quantifiable factors were independent variables was constructed. And it was carried on the analysis, comparison and optimization. GDP growth change and main factors were analyzed quantitatively with factors analysis. From analysis above, the fixed assets investment can promote economic growth, and there is long-term stable relation and dynamic balance mechanism between fixed assets investment and GDP in our country. Especially the affect of domestic loan and foreign investment to GDP is more significant.

**Key word:** Fixed assets investment; Capital resource; GDP; Econometrics model

## 1 Introduction

Economic growth is incensement of GDP in a country or region. GDP is sum of consumer spending, investment spending, government spending and net export in expenditure approach. Investment has an important role in GDP growth at present of China, while fixed assets investment which has a close relation with economic growth is the major part in investment, which has a great significance in socialist modernization in our country.<sup>[1]</sup>

The economic grows rapidly since reform and opening up. GDP has been up to 4012.02 billion yuan, which adds to 3921.86 billion yuan than 1985. The fixed assets investment has been to 3109.642 billion yuan, which increases rapidly too, and is more than 1985 of 289.44 times. The fixed assets investment has a great significance in growth by analysis above. Through contribution of fixed assets investment to GDP is decrease on long-term in theory, fixed assets investment would be an important role in economic growth in a foreseeable period of time. The economic construction practice of many years shows that there is a close relation between fixed assets investment and economic growth, which is a major part in economic growth.<sup>[2]</sup> The empirical analysis with specific data would be more significant.

The study has shown that fixed asset investment has a positive relation with economic in America. Speed of economic growth could be promoted by capital investment such as machine equipment in developing country, and contribution of equipment investment to economic growth is 0.2175, the contribution of non-equipment investment to economic growth is 25% of the former.<sup>[11]</sup> The study of Younge shows that physical capital, human capital and labor participation are the main reason why East Asia especially the Asia Tigers succeed in economic growth.<sup>[12]</sup>

The domestic study on investment and economic growth is mainly concentrated in correlation analysis and simple regression analysis, study on causal relationship is few. For example, Liu J Q analyzed causal relationship between economic growth and fixed asset investment with data in 1991-2000, which showed that the causal relationship between fixed asset investment and GDP is not significant, but the current relevance between fixed asset investment and GDP is significant.<sup>[3]</sup> Besides, Ran J Y, Yuan G C selected data of fixed asset investment and economic growth in 1978-2003 and described orbit between fixed asset investment and economic growth, then correlation analysis and regression analysis were used for analysis of fixed asset investment and economic growth, which showed that the derive of fixed asset investment to economic growth is significant.<sup>[6]</sup> Ge J L explored relation between fixed asset investment and economic growth with method of Granger causality test, ADF stationarity test, co-integration relationship inspection and ECM model, and the result showed that fixed asset investment is a main factor that derives economic growth, and fixed asset investment was affected by economic growth.<sup>[7]</sup> Meanwhile, co-integration relationship existed between fixed asset investment and economic growth. Wang Y X analyzed fixed asset investment and economic growth empirically with EBA, which showed that the relation between fixed asset investment and economic growth is significant and the economic growth was mainly promoted by incensement of fixed asset investment, and some advices were given.<sup>[8]</sup> The data was selected as fixed asset investment and GDP in 1985-2010. The fixed asset investment is divided into state budget, domestic loan, foreign investment

and self-raised funds and other capital resource to analyze relation between fixed asset investment and economic in this paper. Relation between kinds of investment and economic growth is analyzed with method of econometric model and Eviews6.0.

## 2 Methodology

### 2.1 Variables selection and data collection

Fixed assets investment and economic growth have dialectical relation of mutual promotion and restrict in theory. On one hand, fixed assets investment has a great influence in facilitating economic growth; on the other hand, the fixed assets investment would be influenced by economic growth. But the facilitation of investment to economic growth is limited, namely enough investment capital, enough investment factors and coordination between investment capital and investment factors. The stable operation of national economy would be influenced unless development of investment capital and investment factors. The sources of fixed assets investment capital included state budget, domestic loan, foreign investment and self-raised funds are analyzed in this paper.<sup>[13]</sup> Namely the Multiple linear regression models in which GDP is dependent variables and other quantifiable factors which include state budget, domestic loan, foreign investment and self-raised funds are independent variables is constructed. The data of GDP(Y), state budget ( $x_1$ ), domestic loan ( $x_2$ ), foreign investment ( $x_3$ ) and self-raised funds ( $x_4$ ) in 1985-2010 is collected, as shown in Tab.1

**Table 1 The Data of GDP and Fixed Assets Investment (Billion Yuan)**

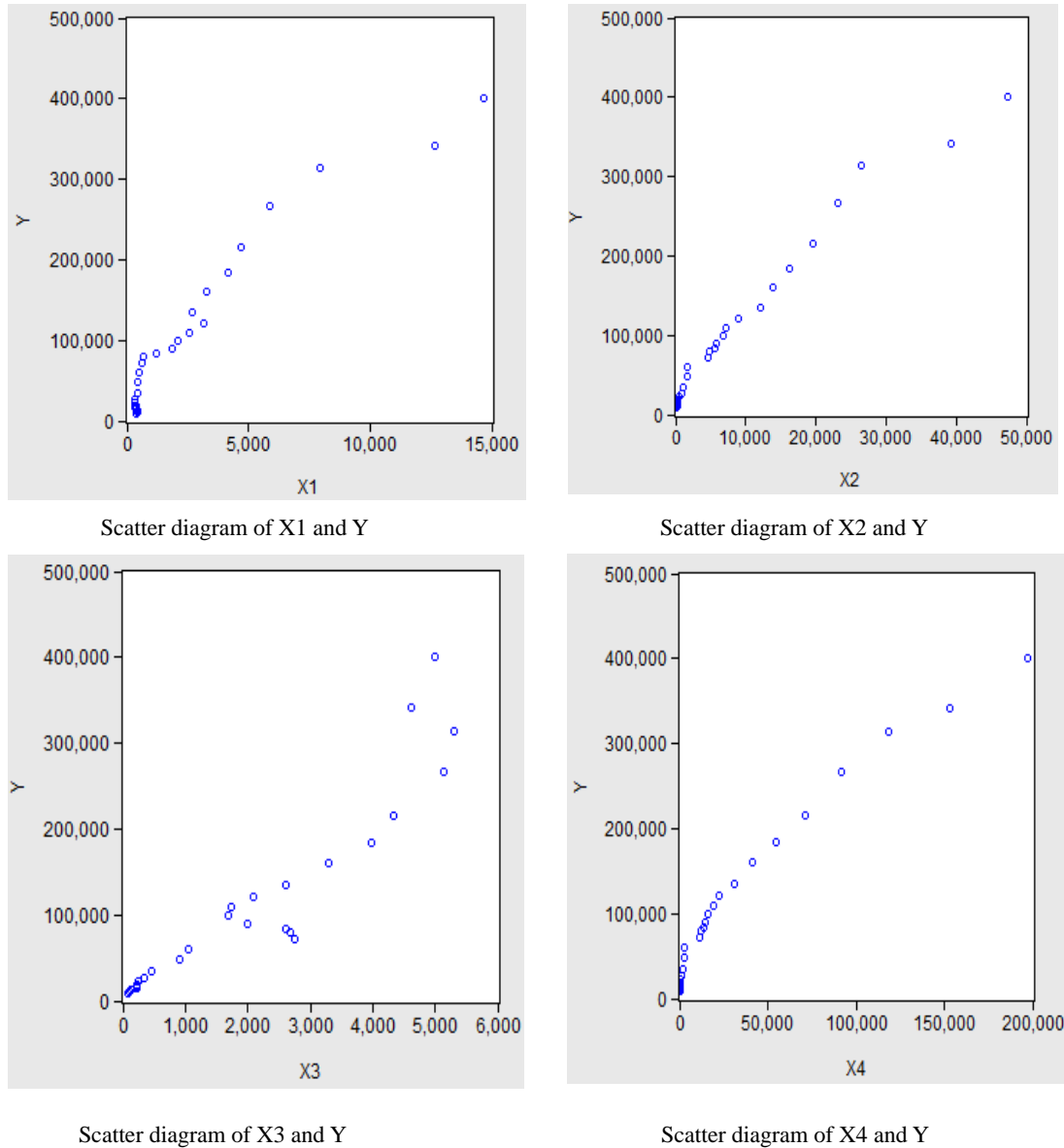
Year	GDP (y)	State budget (x1)	Domestic loan (x2)	Foreign investment (x3)	Self-raised funds (x4)
1985	9016.00	381.18	187.92	73.52	339.99
1986	10275.20	417.39	200.13	109.54	344.65
1987	12058.60	438.52	255.46	139.01	382.78
1988	15042.80	381.66	284.66	218.31	488.75
1989	16992.30	323.33	293.00	221.45	495.03
1990	18667.80	363.59	378.62	224.05	529.92
1991	21781.50	348.45	527.07	239.96	746.73
1992	26923.50	307.87	831.48	334.15	1242.92
1993	35333.90	431.76	1117.55	456.15	1991.25
1994	48197.90	434.57	1583.45	912.03	2820.48
1995	60793.70	491.67	1646.24	1055.42	3121.86
1996	71176.60	625.90	4573.70	2746.60	11151.00
1997	78973.00	696.70	4782.60	2683.90	12556.10
1998	84402.30	1197.40	5542.90	2617.00	14015.60
1999	89677.10	1852.10	5725.90	2006.80	14638.10
2000	99214.60	2109.50	6727.30	1696.30	16317.30
2001	109655.20	2546.40	7239.80	1730.70	18914.00
2002	120332.70	3161.00	8859.10	2085.00	22816.70
2003	135822.80	2687.80	12044.40	2599.40	31449.80
2004	159878.30	3254.90	13788.00	3285.70	41272.60
2005	184937.40	4154.30	16319.00	3978.80	55105.80
2006	216314.40	4672.00	19590.50	4334.30	71076.50
2007	265810.30	5857.10	23044.20	5132.70	91373.20
2008	314045.40	7954.80	26443.70	5311.90	118510.40
2009	340902.80	12685.70	39302.80	4623.70	153514.80
2010	401202.00	14677.80	47258.00	4986.80	197099.20

Data resource: Statistical yearbook of China in 1985-2010

### 3 Model Constructing

#### 3.1 Model selection and parameter selection

The scatter diagram of GDP(Y) and state budget ( $x_1$ ), domestic loan ( $x_2$ ), foreign investment ( $x_3$ ) and self-raised funds ( $x_4$ ) is shown in Figure1 according to Tab.1. The x-coordinate is fixed assets investment capital, and y-coordinate is GDP, the result is shown in Figure 1.



**Figure 1 The Scatter Diagram of GDP(Y) and State Budget ( $x_1$ ), Domestic Loan ( $x_2$ ), Foreign Investment ( $x_3$ ) and Self-Raised Funds ( $x_4$ )**

The linear relation between GDP and fixed assets investment is obvious according to Figure1. The Multiple linear regression models is shown as below.

$$y = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + u \tag{1}$$

#### 3.2 Parameter estimation and test

##### 3.2.1 Parameter Estimation

The result was shown in Figure2 with least squares estimate and Eviews6.0.

Dependent Variable: Y  
 Method: Least Squares  
 Date: 06/03/12 Time: 19:46  
 Sample: 1985 2010  
 Included observations: 26

	Coefficient	Std. Error	t-Statistic	Prob.
C	8824.131	4858.479	1.816233	0.0836
X1	13.00474	6.985882	1.861574	0.0767
X2	0.056171	2.770983	0.020271	0.9840
X3	27.01617	4.356770	6.200962	0.0000
X4	0.349360	0.404549	0.863581	0.3976
R-squared	0.991238	Mean dependent var		113362.6
Adjusted R-squared	0.989569	S.D. dependent var		111321.3
S.E. of regression	11369.52	Akaike info criterion		21.68630
Sum squared resid	2.71E+09	Schwarz criterion		21.92824
Log likelihood	-276.9219	Hannan-Quinn criter.		21.75597
F-statistic	593.9225	Durbin-Watson stat		1.267809
Prob(F-statistic)	0.000000			

Figure 2 The Estimate Analysis Results

According to Figure3, the result is shown as below.

$$y = 8824.13 + 13x_1 + 0.06x_2 + 27.02x_3 + 0.35x_4 + u \tag{2}$$

(0.18) (1.86) (0.02) (6.20) (0.86)

$$R^2 = 0.99 \quad \hat{R}^2 = 0.99 \quad DW=1.26 \quad F=593.92$$

- (1) Test of goodness of fit:  $R^2 = 0.991238$ , the goodness-of-fit is obvious high.
- (2) Significant test of formula:  $F \sim Fa(k, n - k - 1)$ , the significant test is well.
- (3) Significant test of variables: When  $\alpha = 0.05$ ,  $n - k - 1 = 21$  according to T distribution table,

$t_{0.025}(21) = 2.08$ . So variable  $x_3$  is significant according to Figure2. But  $R^2 = 0.99$ , and  $\hat{R}^2 = 0.99$ , which means that explanatory of model is reasonable.[4]

The reason would be the following as the data we select is time series data: the joint linear function of each variable to y is significant, but independent linear function of each variable to y is weak as collinearly among variables, so T test is not significant. The model above should be tested and adjusted according to econometric.

3.2.2 Test of Econometric

(1) Multicollinearity Test

From the analytical result of the model estimation we can see that, the R2 value in the model is higher, but the checkout value of t of x1,x2 and x4.therefore,there is multiple linear in the model. It modifies the model via eliminating variables with gradual regression method, and we obtain this model:

$$y = 12681 + 6.33x_2 + 19.39x_3 \tag{3}$$

(3.27) (16.08) (7.04)

$$R^2 = 0.989 \quad \hat{R}^2 = 0.988 \quad DW=1.45 \quad F=1038$$

Both  $R^2$  and  $\hat{R}^2$  increase when  $x_3$  is added as shown in Figure6. Symbols of estimate is well, coefficient of  $x_3$  is significant at significant level of 5%, and coefficient of  $x_2$  is not influenced.

(2) Autocorrelation Test

The result of self-correlation test is shown in Figure 3.



Test Equation:  
 Dependent Variable: RESID  
 Method: Least Squares  
 Date: 06/04/12 Time: 09:35  
 Sample: 1985 2010  
 Included observations: 26  
 Presample missing value lagged residuals set to zero.

	Coefficient	Std. Error	t-Statistic	Prob.
C	-181.4830	3796.449	-0.047803	0.9623
X2	0.059671	0.430208	0.138702	0.8910
X3	-0.144616	2.817377	-0.051330	0.9595
RESID(-1)	0.316888	0.215172	1.472720	0.1557
RESID(-2)	-0.263205	0.240382	-1.094943	0.2859
R-squared	0.123025	Mean dependent var		-1.97E-11
Adjusted R-squared	-0.044017	S.D. dependent var		11650.37
S.E. of regression	11904.02	Akaike info criterion		21.77818
Sum squared resid	2.98E+09	Schwarz criterion		22.02012
Log likelihood	-278.1164	Hannan-Quinn criter.		21.84785
F-statistic	0.736490	Durbin-Watson stat		2.168283
Prob(F-statistic)	0.577477			

Figure 3 Autocorrelation Test

DW=2.168, and n=26, k=4. dL=1.06, dU=1.76 at significant level of 5%. As 1.76=dU<DW<4-dU=2.24, there is no self-correlation in this model.<sup>[5]</sup>

(3) White Test

The result of White test is shown in Figure8.

Heteroskedasticity Test: White

F-statistic	3.418798	Prob. F(5,20)	0.0215
Obs*R-squared	11.98156	Prob. Chi-Square(5)	0.0350
Scaled explained SS	11.99588	Prob. Chi-Square(5)	0.0348

Figure 4 The White Test

The p-value is less than 0.05 as Figure8.shown, so hypothesis that there is no heteroscedastic should be rejected. Namely, heteroscedastic exists in random error of the model. Then the model is adjusted with method of logarithmic as shown in Figure 5.

Dependent Variable: LOG(Y)  
 Method: Least Squares  
 Date: 06/04/12 Time: 10:16  
 Sample: 1985 2010  
 Included observations: 26

	Coefficient	Std. Error	t-Statistic	Prob.
C	6.113884	0.140635	43.47327	0.0000
LOG(X2)	0.612965	0.019200	31.92446	0.0000
X3^3	1.55E-12	7.32E-13	2.113911	0.0456
R-squared	0.990802	Mean dependent var		11.09247
Adjusted R-squared	0.990002	S.D. dependent var		1.158298
S.E. of regression	0.115817	Akaike info criterion		-1.365444
Sum squared resid	0.308512	Schwarz criterion		-1.220279
Log likelihood	20.75078	Hannan-Quinn criter.		-1.323642
F-statistic	1238.777	Durbin-Watson stat		1.291059
Prob(F-statistic)	0.000000			

Figure 5 The Analysis Result of Adjusted Model

$$Ln y = 6.11 + 0.61 Ln x_2 + 1.55 x_3^3 \tag{4}$$

(43.47) (31.92) (2.11)

$$R^2 = 0.99 \quad \hat{R}^2 = 0.99 \quad DW=1.29 \quad F=1238$$

The heteroscedastic is eliminated through test and adjust of model, accuracy of parameters is promoted, and both fixed-squared figures and F-value are promoted too. The analysis that growth of GDP is affected by kinds of fixed assets investment in recent years is shown in model above, while the

influence of domestic loan and foreign investment on GDP is significant as the empirical analysis shows, and the influence of state budget and self-raised funds on GDO is insignificant.

#### 4 Conclusion

The model between GDP and kinds of fixed assets investment is constructed and data in 1985-2010 was selected for empirical analysis, the multiple linear regression models between GDP and kinds of fixed assets investment is got with method of multicollinearity test., self-correlation test and white test. The relation between GDP and kinds of fixed assets investment in 1985-2010 could be interpreted reasonably. From analysis above, there is long-term stable relation and dynamic balance mechanism between fixed assets investment and GDP in our country, especially the affect of domestic loan and foreign investment to GDP is more significant.

The Chinese economic increases rapidly through own advantages, absorbing foreign investment and adding fixed assets investment. The affect of kinds of fixed assets investment to GDP is analyzed in this paper. We can see that from the model, although in recent years, according to the economic background, various types of fixed asset investment have affected GDP growth, the empirical analysis shows that, the domestic loans and the use of foreign investment has obvious effects on GDP. Therefore, China should pay attention to the domestic lending and the use of fixed assets of foreign capital investment, make corresponding policy, and take measures to promote the economic growth in China. The practice of economic construction shows that economic growth is affected by both fixed assets investment and time factor, which gives us a guide to attract more investment as expand fixed assets investment.

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# Research on the Construction of College Campus Culture from the Perspective of Harmony Society

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**Abstract:** Campus cultural construction is the important way to strengthen and improve the ideological and political education of college students. From the perspective of harmony theory, this paper analyzes the significance of present harmonious campus cultural construction. Combined with the reality of college students' ideology, it proposes three ways for harmonious campus cultural construction, which includes insisting on adopting and developing, basing on people's overall development, constructing harmonious teaching environment.

**Keywords:** Harmony; Campus Culture; Construction

## 1 Introduction:

“The harmonious culture is the crucial spiritual support of unity and progress to all the people”<sup>[1]</sup>, which has been pointed out in the Report of the 17<sup>th</sup> CCP National Congress. College campus culture is an important part of the construction of socialist harmonious society culture. To strengthen the construction of college, campus culture has a very significant meaning for strengthening and improving college students' ideological and political education, improving their overall quality, developing the advanced socialist culture and building the socialist harmonious society.

## 2 The Connotation of Harmony Theory and Harmonious Campus Culture

Harmony is necessary for the existence and development of a system. According to the dialectical logic of things themselves, revealed in the materialist dialectics, harmony is the integration of the differences of things in essence, and a state in which things exist and develop. Furthermore, it reflects the fact that contradictory unity, in its developing process between the opposites, has shown coordination, consistency, balance, integrity and the regular dialectic category.

Harmonious culture is to advocate and pursue harmony as its value orientation, which combines the idea, way of thinking, behavior and social fashion as a whole, and reflects people's overall view, basic ideas of harmonious society, which is a very important part of socialism with Chinese characteristics. Harmonious culture is not only the harmonious society's important characteristic, but also the cultural origin and spiritual power to realize the social harmony.<sup>[2]</sup>

According to the harmony theory, the harmonious campus, is a balanced theory, coordinating promoted harmonious state, among the various development elements of colleges, the essential one is harmonious culture. And the basic of harmonious campus construction lies in the construction of campus culture. The harmonious college campus culture refers to the culture created by the coordinated efforts of college teachers and students, which reflects its value, the ideal faith, group consciousness, the group mentality, behavior standards, and it is a system consisting of institution and spiritual culture, an existing form of the campus peculiar culture inheritance, whose core content can be summarized as “what sort of man the college students are educated to be” and “what kind of life they are guided to have”. The harmonious campus culture is not only the basic aim and connotation of constructing the harmonious campus, but also the basic way and mode to construct the harmonious campus.<sup>[3]</sup>

## 3 The Significance of the Harmonious Campus Culture Construction

### 3.1 To has a very important meaning for improving the overall quality of college students

College is an important position not only to develop socialist builder and successor, but also to spread socialist spiritual civilization and socialist culture. Campus culture construction is an important way and method of the college ideological and political education, whose ultimate purpose is to develop socialist builder and successor with ideal, morality, culture and discipline in a healthy and comprehensive way.

### 3.2 To be one of the most important parts of socialist advanced culture

College is a creation and transmission position of advanced thought culture, which is a leading culture in social system. It is the best to express the mainstream value culture, such as idea, faith, social fashion, behavior standards, value orientation, group consciousness and group mentality. The construction of harmonious campus can provide a high level of spiritual and intellectual support for national economic development and the whole society's harmony.

### **3.3 To play an important role in promoting social harmony and stability**

Campus culture is to take teachers as the leadership, as well as the students as the main body, and aims to accelerate students' growth and improve their cultural quality and aesthetic sentiment. It is the material and spiritual achievement created by all the teachers and students working together, providing the micro foundation of spiritual support for social harmonious culture construction. Secondly, the construction of the whole society's harmonious culture needs a lot of students of ability out of college's output. The harmonious campus culture construction, which can provide a harmonious environment for the college students' growth, consummating their knowledge structure and improving their quality and ability, has a significant effect on the construction of social harmonious culture.<sup>[4]</sup>

## **3 The Approach to Strengthen Campus Culture Construction**

### **3.1 To insist on adopting and developing, innovating advanced campus culture, promoting the scientific spirit**

Advanced campus culture includes not only the strong academic atmosphere, colorful cultural life, and civilized way of life, good campus environment, and the common value orientation, but also the college's environment, education, scientific research, equipment and so on. To construct harmonious campus culture, it is essential to insist on advanced cultural factors contained in campus culture, such as life belief, morality and aesthetic taste, to guide and shape the teachers and students staff.<sup>[5]</sup>At the same time, it is essential to inherit the excellent traditional culture, absorb the useful excellent international culture, adhere to combine inheritance and innovation, and create advanced campus culture that can not only honor the excellent tradition, embody the era spirits, but also base on domestic and face the world.

### **3.2 To adhere to people-oriented, accelerate people's overall development**

To adhere to the people-oriented, is to reflect the students-centered, to take the cultivation of students as responsibility, to promote the quality education as the main line. Teaching, supervising, and serving students aim to guide and promote the all-round development of students, and their healthy growth. To adhere to the humanistic care, can promote the harmonious interpersonal relationship between educators and the students, Insisting on the outlook of scientific development, is to take quality education as the foundation, take the construction of the academic discipline as the core, pay attention to the students' psychological health, cultivate students' lofty ideological values and good moral quality, guide and help students to set up the correct world outlook, the outlook on life and values, and to improve the students' culture.

### **3.3 To adhere to take campus cultural life as carrier, construct harmonious teaching environment**

Colleges should vigorously develop the colorful campus culture activities to meet the needs of the spiritual and cultural life of teachers and students. It is essential to guide students to advocate science, cultivate their spirit of innovation, improve their cultural quality and campus culture appreciates. To make full use of good students' community organization, expand students' quality, reveal the remarkable characteristics and personality of campus culture. To widespread extracurricular activities, can help college students to establish correct, lofty aesthetic psyche, cultivate rich imagination, keen insight, noble and elegant aesthetic taste. It is necessary to strengthen the network culture construction, to play the network education of guiding function, to enhance the sense of times and pertinence. All in all, the organization of various campus cultural activities that teachers and students extensively participate in, can strengthen the cohesion and solidarity of teachers and students, ensure the harmonious development of colleges.

## **4 Conclusion:**

Harmonious campus construction is a key element of harmonious society construction. It is right to lead harmonious campus culture construction with socialism core value and promote college students to receive and absorb college spirit gradually, and to adopt and develop the college spirit. It is important to pay attention to teachers' culture, to bring teachers' leadership into play, to try hard to build special culture and promote harmonious campus culture appreciates, and to continually promote the ability of students and social harmonious stability.

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# Research on Construction and Management of Color Order of Brand Image

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**Abstract:** This paper mainly, through case study, investigates important role played by colors in the process of promoting a brand image. For a company, its brand image is not only an explicit transmission of its products to the potential customers, but also a way to deliver its profile. The innovation of this paper lies in putting forward the idea of color-order development for a brand image. On the basis of the previous study of domestic brand images, the author develops a new color order for brand image. Since most customers' first impression on a brand image is its colors, the promotion and maintenance of a brand image cannot be without the promotion and maintenance of its color order. Therefore, the promotion and maintenance of its color order is essential in developing a brand image.

**Key words:** Brand image; Color order; Color order management; Color order construction; Case study

## 1 Introduction

Famous American marketing theorist Philip once said: "Brand image contains its consumers' faith in it". Therefore, a brand image is not only used to distinguish itself from other brands, but also a symbol of the company. For consumers, the deepest impression a brand image deliver to the customers is its colors. A brand image is passed to the consumer through visual elements, of which the colors are an explicit factor. And color is also an important element to catch consumers' attention.

Nowadays, a large number of scholars and institutions at home and abroad are studying color, including Color and Public Art Research Center of Nankai University, cofounded with Nippon Color and Design Research Institute (NCD). The color system of NCD, on the basis of Mechanics Color Theory, is developed in a more systematic and statistical way to explore the connotation of color. Its researches lay more emphasis on the color psychology and wide range of applications in different designs. Although some aspects of brand image are dealt with, there are only studies in combined usage of color, language, and environment and these studies are not systematic, for example, German researcher Eva Heller studies color from cultures, languages and environments. Up to now, there is no mature system in developing color order, let alone its promotion and management, which are weak points in color study at present.

No matter what industry it is, its leading brands all have their unique color features. Pepsi-Cola's blue, McDonald's yellow, Kentucky's red and Starbucks green all have its own industrial features. To be more specific, Pepsi-Cola chooses blue, which is a symbol of creativity and rebellion, to represent its difference from its main competitor Coca-Cola, which chooses red as its dominant hue. The jet Pepsi hired is painted in blue to deliver Pepsi's new idea to the world and it leaves its customers a deep impression through media. Sometimes, the combination of certain colors and certain forms will generate a very impressive image, such as red and green in traffic lights<sup>[1]</sup>. For many brands, color is the most identifiable element in the consumers' impression. When customers hear, know, or choose goods, they, mainly construct a soul exchange with the brand through its color. Consumers choose a brand because they trust it, and the reason why people trust the brand is that it can give them a sense of emotional communication and a chance to display their personal taste. Therefore, developing a brand image is not only for providing a unique product with certain functions, but also helping to create an enjoyable atmosphere in which its customers can enjoy and relax themselves.

In U.S. marketing industry, there is a "7-Second Law", which means that consumers will decide whether to purchase certain goods within 7 seconds. Consumers' first impression on goods may arouse their interest in better knowing its function, quality and other aspects.

If company neglects the importance of visual design, it does not only lose some attentions on its goods but also its potential customers. In short seven seconds, the color of a commodity will occupy 67% of the customers' attention, so color is a window to presenting brand image, and a proper color order can promote the brand image, which is an immediate cause in the choices of consumers' purchase.

Color is a feeling produced after light stimulation on people's visual organs and it is an important component of visual communication. The principle of color composition is to achieve a balance in color through using and reconciling its hue, brightness and purity. The generation of color order depends on

pursuing the balance between the unity and the change in colors<sup>[2]</sup>.

Color system can be divided into achromatic system and chromatic system. Order-relation can be explained as a kind of gradual change or variation in property. Color order presents the harmonious beauty of colors. The word “harmonic” means “eye-pleasing, concerted, integrated and orderly. Proper development and management of color order can enhance communication between a company and its customers.

Poor color decisions can result in lack of competitive advantage, ineffective or incorrect communications with product or brand characteristics, and untold dollars in wasted inventory comprised of unsold products in undesirable colors<sup>[3]</sup>. The development and management of color will help to guide consumers’ purchasing behavior, and also make a contribution to the global marketing and brand promotion in different cultures, which are extremely important for a company. Same color may present different connotations in different nationalities, regions and countries. In Japan the idiom “White represents winning and black losing” comes from rules in sports sumo, in which white star is the symbol of winning while black star the symbol of losing. Thus, white also becomes a symbol of justice and power. However, China and India, both in Asia, regard white as closely related with calmness and quietness and thus white become also a symbol of death. Same color in different religions also presents different connotations, for example, in Buddhism red is the color of life and creativity and yellow is known as the noblest color symbolizing ultramundane state. The garment of monks and temple often choose yellow as their color; in Christianity, yellow is believed to be the color of clothes of traitor Judah, which is the symbol of ignobility; in Islam, yellow is always associated with desert, drought and regarded as a symbol of death. Golden in Buddhism is a symbol of sacredness, representing the glory of the Buddha dharma and ultramundane state. Orange stands for brightness. In Southeast Asia, we can see that most of decorations of monks’ garments, temples and palaces are painted in orange. We need to investigate and analyze different meanings of different colors in different areas and only by doing so can we avoid taboo and find out their preferences in this area so as to construct adaptable color order for this area.

Through the analysis of color and the development of color order, we find that we need to make different management of color order for different countries and areas, which will help to enhance communication between a brand and its consumers and finally lead to the consumers’ acceptance to the brand.

## 2 Relationship Between Color Order Management and Brand Image

### 2.1 Brand image and its management

At present, homogenization is a very serious problem in market. Different brands and different products rush into market with similar models and colors. How can a brand represent its own unique characteristics? Only by employing suitable colors can a company build its own brand and unique characteristics and cultivate the originality of the brand and can a company make its products identifiable to their consumers (see figure 1).

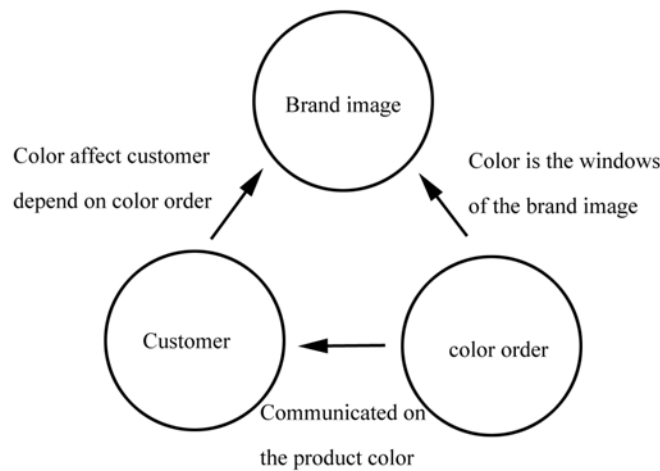


Figure 1 The Process of the Color Order and Customer Information Exchange

### 2.2 Color order in brand image

With different backgrounds in gender, age, family, ethnicity, culture, cultivation, occupation, income, and habits, different people have their own preference for different colors. Generally speaking, infants prefer red and yellow color (pure color); children like red, blue, green and gold; young people like red, green, blue, black, and mixed color; the middle-aged like purple, brown, blue and green; males prefers colors representing solidity, strongness, warmth, while females love soft, gentle, lyrical tone. In different seasons, different brand promotions also need to take the weather into consideration. Companies need to choose different colors in different seasons, especially for products sold in a certain season of a year. That is to say, products primarily sold in summer should be designed in cool colors, while those mainly sold in winter should be designed in warm colors. Brand image are developed through building a complete set of color order and making minor changes to adapt to the change of many factors, such as different ages, seasons, etc.

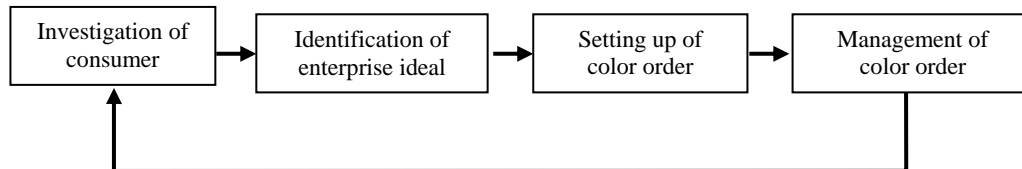
**2.3 Management of color order enhances brand image**

President of Coca-Cola Woodruff once said, “even if the whole Coca-Cola were burnt into ashes over one night, he could make a comeback in a very short time with only the brand 'Coca Cola' ". Woodruff’s confidence comes from the brand image of Coca-Cola. Coca-Cola is a reddish-brown liquid instilling energy into its consumers. Red is a positive hint of passion and vigor<sup>[4]</sup>, so the company chose red as the drink’s main hue and kept it for over one hundred years. A set of complete color order of long period will leave consumers’ deeper impression and helps to promote the brand image, for example, red of Coca-Cola, yellow of Hz, blue of IBM.

**3 The Development and Management of Color order**

The development of color order is a systematic project throughout the whole process of brand development. From the setting up of the brand to final products for consumers, every link should be integrated with the brand’s core philosophy in accordance with the characteristics and features of colors to make the development and management of color order more effective. Successful color order should contain the brand’s core philosophy and its consumers’ feeling and experience to work out a suitable system for the brand.

Generally speaking, the development of color order includes three processes: investigation of consumer, identification of enterprise ideal and setting up of color order. (See figure 2). Color-order management is feedback evaluation and management on the basis of the consumers’ feedback. The development and management of color order is a repeated and dynamic process, constantly updated and improved.



**Figure 2 The Development and Management of Color Order**

**3.1 Investigation of consumer**

In order to make the brand image attractive and affective in accordance with its ideal, at company should first employ scientific and rigorous methods to investigate and study the brand-setting-up process and its future expectations. The whole investigation process includes setting up of enterprise brand, expectations of the products, investigation of competitors in the market, investigation of consumers, etc.

The company should investigate its competitors’ potential, advantages in marketing competition, and strategy and achievements in developing color order, and the competitors’ future development

Through the analysis of structure, the company should investigate certain people with particular backgrounds. Also the company should pay attention to its image, popularity and impression in the big market.

**3.2 Identification of enterprise ideal**

Identification of the enterprise ideal is to set a goal for its brand image. Many enterprises have no clear idea for their own brand images and future expectation, so help from designers is necessary, which can help enterprises to better understand the advantages and disadvantages in their daily operation, make clear their target market, and alter the existing brand marketing strategy so as to form a proper enterprise ideal.



### **3.3 Setting up of color order**

Based on the integration of enterprise ideal, consumers' preference and connotations of colors, a proper color order should take a good balance between brand image and consumer. Companies should first have a clear understanding of consumers' psychology, then design products that consumers want, and at last employ proper colors for products, package, environment decoration, and shopping-bag through these processes, a bridge is served between products and consumers to realize a harmonious unity of man, color and product, which is a dynamic process of color order development.

### **3.4 Management of color order**

Companies should send samples to their consumers to revalue whether their products are popular with them and whether they can reach the target: the integration to brand image and consumers' brand expectation. At the same time, companies should test its feasibility in many aspects, such as material, technology, cost, etc. After the color order of a brand is completely developed, the maintenance of color order becomes very important and it needs minor changes to adapt to an ever-changing market and consumers with different backgrounds. Only by doing so can the brand image be more distinctive more popular with consumers.

## **4 Case Study**

We find that Chinese athletes appear in P&G's latest Olympic marketing, and in China the company has adjusted its marketing and changed its logo into red with yellow, which are colors Chinese people are fond of. However, the company chose blue with white as its logo color for the Olympic marketing in other countries. P&G's success in color design lies in deep understanding into the process of "development and management of color order. Although P&G chose blue with white as its logo colors in global marketing, in China, base on the investigations and feedbacks in China, it was found that red and yellow are more popular with Chinese people, for in its long history, yellow is believed to be a color representing royalty and red is a symbol of happiness and luck. P&G's change in logo colors for Chinese market is based on the fact that Chinese people obviously prefer red and yellow to blue and white. Integrating Chinese tradition and the enterprise ideal, P&G achieve a remarkable effect in Chinese market.

## **5 Conclusion**

For companies, establishing a complete dynamic color order will not only make their brand images superior to their competitors in visual effect, but also help to accumulate the brand value and enhance the brand images. Companies should make a proper management of color order so as to attain a desirable effect and thus achieve long-term maintenance and perfection of their brand images. In today's society huge numbers of commodities share more and more similar characteristics and features, so if a company wants to distinguish its brand image from others, the development and management of color order must be an essential part in company's daily operation.

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# On Theoretical Logic of Introduction System Engineering to University Moral Education Model Construction

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**Abstract:** Begin with the introduction of moral education model, the research makes an analysis on the two aspects of System Engineering: system and engineering. Then the research combines the system engineering theory with the university moral education model construction. Starting from that theoretical logic point and frame, the research integrates the general theoretical logic with the experimentally empirical logic, tries to put forward the principles and the features of university moral education model construction which aiming at offering a theory frame to the university moral education model construction for reference.

**Key words:** System approach; Engineering means; Model construction

## 1 Introduction

The British McQuail, D. and the Swede Windahl, S. took Model from the perspective of Communication as “to purposely perform a simplified description about an event or an entity in the form of images”<sup>[1]</sup>. a model attempting to show that any structure or the main components of the process and the relationship between the parts. Model can be more effective to help people to work and improve quality and efficiency, and that’s where the purpose for the construction of moral education model lies.

The book Moral Education Model written by Richard & Harsh, American experts in moral education, while translated by Fu Weili, a Chinese professor specializing in moral education, has ever mentioned that “moral education model works as a way to speculate and judge the course of action of educational institution, it covers the viewpoint on how to develop moral theory along with certain principles and methods on how to promote the development of morality.” Moral education model embodies such kind of moral education activity form which contains theoretical guidance, the structure and procedures of the activities, implementation principle, operating essentials and etc.

In general, start from the aspect of System Engineering science research; system engineering has two sides, “system” and “engineering”. The former refers to the point of multidisciplinary comprehensive research, while the latter means the point of practice, namely putting the results of research into practice.

The System Engineering Theory took its shape in the middle period of last century, “it is a set of theories and methods which target at large and complicated research objects and then plan, exploit, manage and control with certain purpose, designing to achieve overall optimal effect”<sup>[2]</sup>. It includes two inseparable parts, system engineering concepts and system engineering methodology. Among the two, the former refers to a series of basic ideas on system engineering. It comes down to the integration in thinking methods, the mixture in the usage of resources (technology, knowledge, equipment, material) and the science of management. While the latter generally refers to the seven basic logical programs including environment identification, target establishment, value measure, system integration, system analysis, system selection, decision-making and etc.<sup>[3]</sup>.

The scientific model of university moral education indicates a kind of comprehensive, creative and practical moral education. One of the grounds as well as the sources for its construction is from System Engineering, whose thoughts and methods is followed by it and whose practice and application is displayed in it as well.

## 2 Starting from Logical Point: Construct Principles of University Moral Education Model in System Approach

System approach is widely used in each step and run through in whole process of scientific research. Today it is or will challenge a great deal of traditional approaches. In addition, it also works as an intermediate link between philosophical method and other scientific research methods, it is the embodiment and of realistic application of materialistic dialectics. Moreover, adopting this approach

makes the moral education work go scientifically in university moral education model building; however, it also should abide by certain principles.

### **2.1 Organic combination principle of theory and practice**

Moral education is a subject laying equal emphasis on single analysis and comprehensive research. For the reason that the formation, cultivation and change of ideological morality of young students involve many fields and various subjects, the system and engineering of university moral education accordingly have to touch upon those. Thus only by conducting multi-disciplinary comprehensive research, a research rather than the original individual but the systematic one, rather than the plane but the multi-dimensional one during the process of the construction of university moral education model, can university moral education break away from simplicity, improving the overall effect of ideological education and management work and making the new situation of university moral education even better. In addition, the ideological source and theoretical foundation of moral education come from Marxism, it is necessary to apply its theories to direct the construction of university moral education model to absorb the research results and methods of numerous subjects, then form its special theory system, and at last, become a comprehensive scientific methodology of its own features.

### **2.2 Organic combination principle of systematic thinking and optimization**

“Systematic thinking calls for study and speculation on events and entities from all directions, to pursue the maximum output with minimum input by means of optimization thinking.<sup>[4]</sup>” The optimization principle goes well with whatever we do, so does moral education model, just as the saying in *The Art of War* by Sun Tzu put: “the real winners are those who defeat the opponents without battle rather than those who emerge victorious in every battle.” System actually refers to the organic whole, composed of a quantity of interactional and interdependent parts or essential factors, which are lack of the new quality and function that the whole possesses and makes use of them to conduct interaction with certain environment. System engineering would be applied to make systematic analysis about the managed object and to make research into the internal system along with the organic connection between the system and the external environment, aiming at bringing the integrated function of the system into play and realizing the optimization of moral education model, this is the moral education model system engineering theory.

Process index is the precondition, the step to reach optimization; while the effect index functions as an evaluation data. Yet non-excellent effect index indicates that it is necessary to analyze the parameters and the implementation situation on the basis of the process index to figure out the mistakes that were made in the process of carrying out the moral education model. Building university moral education model desires to cultivate it into a multi-level, multi-formed, multi-channel, multifaceted network with integrating the superior and subordinate authorities and interweaving transdisciplinary subjects to fully develop the comprehensive strength of the whole system and to achieve its maximum efficacy. The basic aim of social optimization principle is: in an attempt to acquire the best qualitative and quantitative measure, ideal sequence, the greatest benefit but minimal risk, the least amount of energy via the most advanced cognitive method and modern operation strategy. While its essence is to use optimization method to put minimal human, material and financial resources, time and space, and information input consumption into use to get maximum social value. Meanwhile, marginal cost effect should be reasonably taken into consideration to see whether based on actual demand and whether of necessity to make further input when increasing input in moral education activities, which is of great significance in scientific decision of current university moral education activities.

### **2.3 Organic combination principle of inner control and outer radiation**

There are certain rules for college students' mental activity and the university moral education activity process; cybernetic thinking plays a key role in the construction of university moral education model. Internal control, as a special nouns and complete concept, was not put forward until the middle of the last century and it was only in recent time that China began to use it for reference in enterprise and company management activities. It can be defined as a business process to provide effective organization and management and to prevent errors and other illegal business from springing up<sup>[5]</sup>. While the one that is applied to university moral education model can be defined as an adjustment, communication and constraint process on moral education activities and its practice performed by the university moral education workers employing balance deviation principle of cybernetic thinking to ensure the moral education process not to deviate from the goal.

Each procedure in the practice activity of moral education represents one of the principles of internal control followed by the construction of university moral education model. It covers the following:

1) Environmental control. It refers to various factors which shall erect an influence on the construction process of university moral education model. Including: ① moral education ideas of university party committee; ② team construction of moral education work; ③ campus cultural atmosphere; ④ social trends; ⑤ mass media; ⑥ legal system environment; ⑦ guidance of public opinion; ⑧ family environment and etc.

The above-mentioned environment can be divided into inner and outer one from the perspective of school; the latter determines work direction and content of school moral education while the former decides its work focus and method. At the same time, school moral education work is able to affect and remold social moral education environment, besides, it has a positive function in the construction and optimization of school moral education environment and also play radiation effect on outer environment of school.

2) Decision control. The supposition and judgment, conforming to developing rules of moral education, made by the moral education workers on unknown things or uncertain situations after previous investigation and study analysis to guide the direction and action of the moral education work and. Moral education decision is essential in the development of moral education work, especially in modern time of high development speed. It includes: ① solve programmatic moral education decision through certain democratic procedure; ② regulate decision-making authority on non-programmatic moral education work; ③ make sure decision-making objectives; ④ to consider the efficiency of decision; ⑤ consider tradeoff of decision; ⑥ evaluate moral education phenomena; ⑦ select decision-making method; ⑧ provide reference for making decision.

3) Program control. The policy and procedure the decision-making team of moral education employed in building university moral education model to ensure the realization of its goal. Including: ① process and implementation of moral education; ② clarity of team collective of university moral education work and division of individual responsibility; ③ system standardization and file construction; ④ investigation research.

4) Restrained thought. The practice to eliminate some negative social influence and inflated selfish desire through the restriction of elementary morality and law to guide personal thought into normal social ideology and life field. Including: ① education on "Three Views" (world view, life view, value view); ② education on "Three Isms" (patriotism, collectivism, socialism); ③ education on "Three Morals" (social morality; career morality; family virtue); ④ education on credit; ⑤ legal binding.

5) Process evaluation. A segment in moral education to make use of certain evaluation norms and methods to inspect and judge the effect of moral education process based on the requirements of the moral education purpose. The establishment of moral evaluation system makes a more systematic education theory and contributes to the facilitation of the operation of moral education. Its steps cover: ① establish standard system of moral education process; ② verify evaluation rating and weighting factor; ③ self-evaluation and peer evaluation; ④ investigate and practical exploration.

#### **2.4 Organic combination principle of benefit motivation and spiritual incentive**

Duty and power, dedication and reward, virtue and happiness are inconsistent in the past due to the inequality of moral evaluation and moral reward. On the other hand, moral education workers still dare not to take moral education work and benefit driving as opposite relation. In fact, morality and benefit are compatible and it's unrealistic to expect everybody to give up individual interest to be a moral model because man has risk-averse instinct. Starting from this point, the best way to establish benefit motivation system is to bring the win-win concept on economics into use to suit individual needs.

The establishment of new effective moral education model should bear market economy and benefit motivation in mind, only by effectively blending benefit driving principle into new moral education model, innovating moral education and infusing university moral education work with benefit driving principle to construct new moral education model suiting market economy of society can the methodology on the implementation of long-term effective moral education be able to be established.

The permeability characteristics should be taken into consideration when setting up incentive system. While ideological and political work tends to be soft and elastic even fuzzy, the effect is not easy to expose and quality are difficult to quantify. As a result, it takes time for moderating penetration and relies on oneself to taste, digest and absorb. Thus this requires the participants of moral education activity to possess persistent and persevering will and perspiration and could fulfill their enthusiasm and creativity while working. On the other hand, it also requires, for the sake of the involved subjects and objects, taking incentive measures and setting up a reward and penalty system, both in material and mind.

System approach is a kind of philosophical epistemology and methodology that can make the moral

education process more scientifically. With the development of system engineering, it's urgent to research on the recognition program of engineering design and construction with the aim of getting the best system and the best decision that can make the moral education process more rigors. The interaction diagram of system engineering approach (figure 1) can show the point.

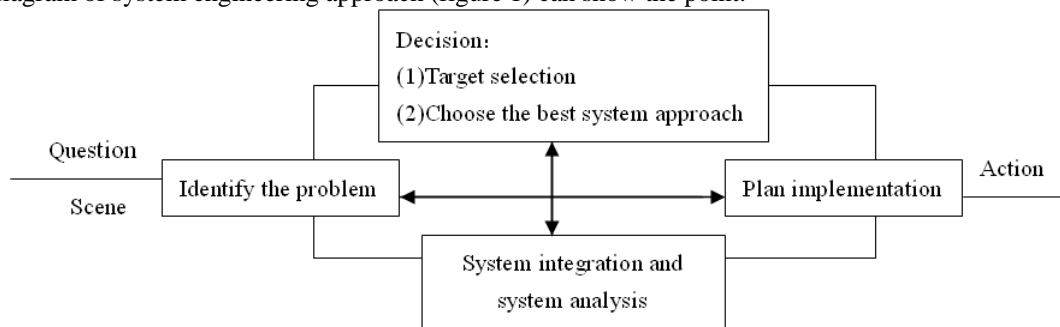


Figure 1 The Interaction Diagram of System Engineering Approach

### 3 Starting from Logical Frame: Construct Specific Features of University Moral Education Model with Engineering Means

Different from other activities, engineering activity has strict regulations and procedures as well as complete stereoscopic structure. Special engineering, for example, contains elements like target, method, resource, process and etc. Scientific logic shows that elements form structure while structure determines mechanism, no exception to the construction of moral education model.

#### 3.1 Strengthen normalization of management from perspective of engineering activity elements

Speaking of normalization, according to educational provision, it mainly refers to the rules and regulations on thought and action of related people, and has compulsory and binding property; to put it in another way, it can be identified with the advocacy to integrate education with management. No rules, no orders. In order to fulfill the desired purpose, ideological and political work of whatever enterprise and public institution should be closely related to the regulatory management.

#### 3.2 Stress advisory of education from perspective of engineering technology means

As for advisory, it refers to the action of individual education and topics education (group consulting) focusing on the development of personality which follow the law of personnel training and growth. The aspects of advisory activities it includes are as the following: study, existence, thought, mind, life, career and etc. With the development of reform and opening up policy, social life changes dramatically and life pace speeds up; under this condition, an increase number of factors have sprung up to threaten people's mental health and challenged their mental capacity. Though the obstacle led by this objective situation is various, yet the key one turns out to be people's mental confusion and imbalance. Therefore, it is essential to advisory education and selective orientation, making advisory educational activity as the major method in improving university moral education model.

#### 3.3 Investigate conscientiousness of process from perspective of engineering target

When it comes to conscientiousness, it indicates that moral education is an operational and programmed process; so as to improve the actual effect of moral education work, the methods and skills in developing moral education work should be investigated. As a matter of fact, moral education process is with its special regularity whether in various business work and social activities or relatively independent moral education process. In addition to a means of fulfilling moral education target, it is a dynamic developing process of each single target. However, moral education process theory belongs to the basic theory, occupying the core status in moral education theory system and providing scientific theory reference for the determination of content, policy, principle and method of moral education.

#### 3.4 Evaluate predictability of decision from perspective of scientific engineering decision

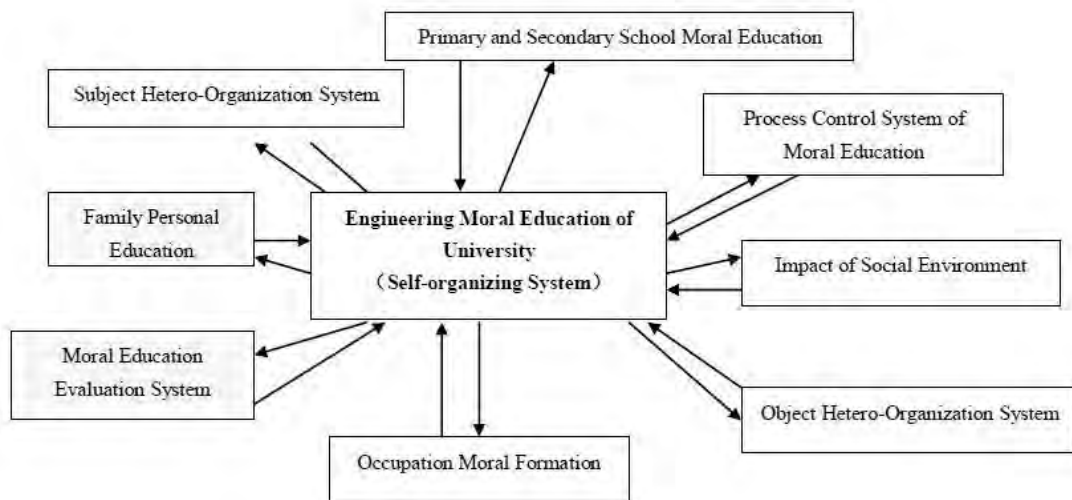
Predictability requires constructing a system suitable to the developing need of moral education and making scientific predication and adequate assessment on the law of future moral education and social development. Decision making on moral education is not as easy as that on others because it has to not only predict human's ideological morals and the action itself but also the factors that producing and influencing them. In this case, moral education decision needs to follow strict conditions; otherwise, it reduces to be personal arbitrary acts. In other words, the awareness of moral education decision

makers should be consistent with the development law of ideological morals. “Whoever wants to do successful work or get desired result should abide by objective regularity, if not; the practice would end in failure.” Said comrade Mao Zedong (Selected Works Of Mao Zedong: Volume I . Beijing: People’s Publishing House, 1991:284). Meanwhile, it is necessary to observe and consider issues in a materialist dialectic way in making scientific decision, plus excellent work experience and insight in carrying out moral education activity.

**3.5 Value penetrability of environment from perspective of engineering resource allocation**

According to the requirements economic law lay for talents, the so-called penetrability emphasize the cultivation of different social activity abilities. Recently whether culture construction and the regular or irregular activities on memorial, celebration, competition and commendation in factories and enterprises or in schools and community are good examples in showing permeability education. Those university quality-oriented education and campus culture ideology in particular infuse education with entertainment and growth, and with the construction of school spirit and academic atmosphere, activating activity form of moral education; these vivid contents of moral education model made university moral education work receive brilliant education effect and were worth to be widely spread in the practice of moral education model.

On the process of university moral education model construction, especially in the exploration stage, it is important to improve the whole engineering moral education scientific evaluation system and technical approaches, such as combining with the quality and the quantity, the focus and the whole, process and result, short term and propection, self-assessment and evaluation, certainty factors and uncertainty factors. It is necessary to control the process according to the level and make an analysis on the integration control system of university Engineering Moral Education by following the basic principle of system engineering. By reviewing of the above principles and characteristics of moral education model and Combining with system approach and engineering means, the research uses self-organization theory on the moral education goal attainment and tries to construct a simulation model of university moral education. The bellow table (figure 2) shows the interaction diagram of system engineering approach.



**Figure 2 The Hierarchical Control Model of University Moral Education**

**4 Conclusion**

University moral education is an item of systematic and holistic engineering which needs to lead system engineering theory to its organization and management with the aim of getting the best effect. Start from the aspect of system engineering, the construction of university moral education need to protest the usage of engineering technical means and follow the attribute of engineering activities, as well as pay attention to put the holistic thinking and system analysis methods into making decision scientifically. Meanwhile, it is necessary to strengthen the regulation and control of moral activities and do some prospective study on moral education that can promote the task of university moral education roundly. Since the model has some special attributes, such as periodicity and given intention, the

university moral education construction need to base certain theoretical logic and create in practice, that can satisfy the demand of development of university moral education in nowadays.

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# Study on The Evaluation Index System of “Three Bases and One Hub” Based on AHP Model: Taking Central Areas in China as an Example

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**Abstract:** The analytic hierarchy process method is employed to construct the evaluation index system study of “three bases and one hub” in the background of the rise of central China strategy. Considering the positioning and perspective of the State Council, data from statistical annual books and relevant research data, based on AHP Model, constructed the evaluation index system, analyzed the position of “Three Bases and One Hub”, proposed corresponding development advices.

**Key words:** Rise of central China; Three bases and one hub; AHP model; Index system

## 1 Introduction

Promoting the rise of central region was raised in the Government Work Report at the first time by Premier Jiabao Wen on March of 2004 and immediately intensive policy measures came into existence in the policy documents such as Notice of Advancing the Growth of Central China and Advancing the Growth of Central China Strategic Planning. Instead of theory studies, the rise of Central China, after most of the national ministries and six provinces proceed arrangement, was rapidly practiced by the government and all sectors of society. In Advancing the Growth of Central China Strategic Planning, the State Council, on September 2009, indicated that central China will become important national grain production base, energy and raw material base, modern manufacturing and high-tech industry base and comprehensive transportation hub. Central China will achieve all-round, balanced and sustainable development of the economy and society.<sup>[1]</sup>

At present, evaluation of regional development mainly focus on China regional policy overall implementation effect, focus on the evaluation of western big development strategy and the evaluation on the strategy of northeast old industrial base to revitalize implementation, but the study on the evaluation of the Strategy of "The Rise of Central China" is not much.

This paper is aimed to construct evaluation index system by AHP method, collect related data from statistical yearbooks and put them into the assessment index system. Then, concrete and convictive advices for the development of “Three Bases and One Hub” can be proposed and come into practice.

## 2 The Principles to Design Evaluation Index

The design of evaluation index system followed SMART principles as below:

S is short for specific, which means the index is clear and unambiguous, without vagaries and platitudes, which must tell user exactly what the meaning is; M is short for measurable, which stresses the needs for concrete criteria for measuring and data which should be available; A is short for attainable, stressing indexes should be realistic which can be figured out and come true; R is short for realistic, standing for that all indexes should be supported by corresponding data and these data can be observed and obtained; T is short for time-bound, which stresses the importance of indexes within a time frame, giving them a valid date.

## 3 Design of AHP Evaluation Model and Index System

### 3.1 AHP evaluation model

The Analytic Hierarchy Process (AHP) is a structured technique for organizing and analyzing complex decisions. Based on mathematics and psychology, it was developed by Thomas L. Saaty in the 1970s and has been extensively studied and refined since then. The first step in the Analytic Hierarchy Process is to model the problem as a hierarchy. In doing this, participants explore different aspects of the problem from general to details, then express it in the multileveled ways that the AHP requires. Once the hierarchy has been constructed, the participants analyze it through a series of pairwise comparisons that derive numerical scales of measurement for the nodes. The criteria are pairwise compared against the goal for importance. The alternatives are pairwise compared against each of the criteria for preference. The comparisons are processed mathematically, and priorities are derived for each node. As a result, the



performance of “Three Bases and One Hub” will be appraised under the conditions of “Rising of Central China”.

In terms of influence among all the factors, indexes are divided into target layer (index A), criterion layer (index B) and basic index layer (index C), which form the integrated index system.

In order to determine the value of indexes’ weight, a judgment matrix is constructed to compare the influence of individual index by pairing comparison method. Quantified by 1-9 scale, a paired comparison matrix was obtained. Value of weight was calculated on basis of judgment matrix and consistency check was executed. The calculating procedure was listed as below: normalize each column of judgment matrix; calculate the sum of each row respectively; average sums of rows, which is the value of weight; examine the consistency once again, calculate the maximum eigenvalue  $\lambda_{max}$  and the corresponding eigenvector and get the consistency ratio calculation  $CR = \frac{CI}{RI}$ . RI is available in the reference books,  $CI = \frac{\lambda_{max} - n}{n - 1}$ . When CR is smaller than 0.1, judgment matrix was considered to be satisfied with the consistency.

**3.2 Design of evaluation index system**

**3.2.1 Evaluation index system of grain production base**

Under the overall goal to evaluate grain production base, According to the study of experts<sup>[2-3]</sup> the index system employed agriculture development primary capacity, agriculture development input capacity, capacity of farming modernization, agricultural output capacity and food supply capacity as criterion layer (index B), consisting of 23 detailed index.

**3.2.2 Evaluation index system of energy and raw materials base**

Under the overall goal to evaluate energy and raw materials base, the index system employed energy and raw materials development supporting capacity, energy and raw materials development input capacity, energy and raw materials production capacity, energy and raw materials output capacity and energy and raw materials ecological development capacity, as criterion layer (index B), consisting of 17 detailed index.

**3.2.3 Evaluation index system of modern equipment manufacturing and high-tech industry base**

Under the overall goal to evaluate modern equipment manufacturing and high-tech industry, the index system employed modern equipment manufacturing and high-tech industry development supporting capacity, modern equipment manufacturing and high-tech industry production capacity, modern equipment manufacturing and high-tech industry contribution capacity, modern equipment manufacturing and high-tech industry growth capacity and modern equipment manufacturing and high-tech industry primary supporting capacity as criterion layer (index B) consisting of 23 detailed index.

**3.2.4 Evaluation index system of comprehensive transportation hub**

Under the overall goal to evaluate comprehensive transportation hub, According to the research of experts<sup>[4-7]</sup> the index system employed comprehensive transportation industry development supporting capacity, traffic and transportation capacity, traffic and transportation transfer capacity, traffic and transportation bearing capacity, as criterion layer (index B) consisting of 14 detailed index.

**4 Evaluation of “Three Bases and One Hub” Indexes**

**4.1 Evaluation of grain production base**

Results of AHP analysis are presented in Chart 1-1 and conclusions are drawn as follows:

**Table 1 AHP Analysis Results of Grain Production Base**

	2005	2006	2007	2008	2009
Average of Central China	0.3485	0.3544	0.3539	0.3659	0.3701
Average of Eastern China	0.2982	0.3029	0.3024	0.2924	0.306
Average of Northeast China	0.3112	0.3062	0.3261	0.342	0.4212
Average of Western China	0.1703	0.1816	0.1785	0.1882	0.1965

Data Source: 2005-2009 Statistical Yearbook of China, Chinese Yearbook of agricultural statistics

These results suggest that central China is playing more and more important roles as the national granary, with obvious advantages. From 2005 to 2009, the AHP value of central China grain production base rose from 0.3485 to 0.3701. Except slight decreasing in 2007, we witness a steady growth. In terms of relative difference, the gap central China advantaged eastern China increased from 0.0503 in 2005 to

0.0641 in 2009; the gap central China led western China slightly decreased from 0.1785 at 2005 to 0.1736 in 2009. In contrast to western typical region of China, northeast old industrial base and eastern typical region of China, the AHP value of central China grain production base remains ahead all the time except that in 2009 the value is lower than northeast old industrial base of China. Generally, central China has an overwhelming advantage to act as the “national granary”.

**4.2 Evaluation of energy and raw materials base**

Results of AHP analysis are presented in table 2 and conclusions are drawn as follows:

**Table 2 AHP Analysis Results of Energy And Raw Materials Base**

	2005	2006	2007	2008
Average of Central China	0.2353	0.2645	0.2743	0.2926
Average of Eastern China	0.3316	0.353	0.3621	0.3536
Average of Northeast China	0.402	0.3269	0.3325	0.3245
Average of Western China	0.098	0.1174	0.1376	0.1402

Data Source: 2005-2009 Statistical Yearbook of China, 2005-2009Energy Statistics Yearbook of China

The data demonstrates that central China is behind northeast and eastern China, but the gap decreased even further. From 2005 to 2008, the AHP value of central China energy and raw materials base increased from 0.2353 to 0.2926, which embodies the real effect of Rising of Central China policy. But what still worth worried about is that central China was ranked 3rd in the four regions (central China, western typical region, northeast old industrial base and eastern typical region of China). Fortunately, the compared gap from eastern China have narrowed from 0.0963 in 2005 to 0.0576 in 2008; the compared gap from northeast old industrial base have narrowed from 0.1667 at 2005 to 0.0319 in 2008; the advantage over western typical region increased much bigger from 0.1376 at 2005 to 0.1524 in 2008. To some extents, the general function of central China as energy and raw materials base need to be improved.

**4.3 Evaluation of modern equipment manufacturing and high-tech industry base**

Results of AHP analysis are presented in table 3 and conclusions are drawn as follows:

**Table 3 AHP Analysis Results of Modern Equipment Manufacturing And High-Tech Industry Base**

	2005	2006	2007	2008
Average of Central China	0.0952	0.1158	0.1709	0.1642
Average of Eastern China	0.5534	0.6813	0.7605	0.8168
Average of Northeast China	0.1611	0.1788	0.2372	0.2497
Average of Western China	0.046	0.0521	0.0814	0.0695

Data Source: 2005-2009 Statistical Yearbook of China, China Statistics Yearbook on High Technology Industry

The data reveals that the delays of construction of modern equipment manufacturing and high-tech industry base in central China and the behind gap is widening in comparison with northeast and eastern China. From 2005 to 2007, the AHP value of central China modern equipment manufacturing and high-tech industry base raised from 0.0952 to 0.1709. Even though the value fall down to 0.1642 in 2008, the rising tendency is obvious. In relation to the compared difference, value of central China is lower than eastern China as well as 0.4582 in 2004 and this gap spread to 0.6526 in 2008; it is 0.0659 lower than northeast old industrial base in 2005 which widen to 0.0873 in 2008. Overall, central modern equipment manufacturing and high-tech industry base development has been constantly lagging behind northeast old industrial base of China.

**4.4 Evaluation of comprehensive transportation hub**

Results of AHP analysis are presented in table 4 and conclusions are drawn as follows:

**Table 4 AHP Analysis Results of Comprehensive Transportation Hub**

	2005	2006	2007	2008	2009
Average of Central China	0.2166	0.1968	0.2687	0.3476	0.3506
Average of Eastern China	0.3413	0.2998	0.4027	0.434	0.4569
Average of Northeast China	0.1383	0.1365	0.194	0.2362	0.2618
Average of Western China	0.0951	0.0676	0.2723	0.1041	0.1229

Data Source: 2005-2009 Statistical Yearbook of China, 2005-2009China industry economy statistical yearbook

The results illustrate a fact that central China functioned better and better as comprehensive transportation hub in China, but it still fell behind several developed provinces. From 2005 to 2009, the AHP value of central China comprehensive transportation hub went up from 0.2166 to 0.3506. A rising tendency can be easily observed, even though the value is a bit lower in 2006. With reference to relative difference, the gap central behind eastern China decreased from 0.1247 to 0.1063; the advantage over northeast increased from 0.0783 to 0.0888 while the advantage over western China increased sharply from 0.1215 to 0.2277. It is clear that outlook of central comprehensive transportation hub construction continues to be promising when central China quicken its pace to catch up with eastern China as well as leaving northeast behind.

## 5 Conclusions

Analysis results reveal that central China has made gratifying achievements in construction of “Three Bases and One Hub”, especially in the aspect of grain production base development which is not only much better than eastern China but also better than northeast old industrial base and western typical region of China. Central China deserved the title of “National granary”. Meanwhile, its transportation hub construction is the second in the four main regions in China and is emulating the prosperity of eastern China. But, what still worth worrying about is the constructions of ‘energy and raw materials base’ and ‘modern equipment manufacturing and high-tech industry base’. In these two areas, the gap behind eastern China has not been reduced, even in the increasingly widening. It is far to meet the position and requirement of Central Committee of the Communist Party of China and the State Council. Aimed at this point, this paper posted several development advices to solve the problem.

### 5.1 To Build food core producing area and strengthen the rise of central China power

Grain industry is a traditional industry, superior industry and fundamental industry in central China, which is one of the most important industry pillars to support economic development. The achievements they got in grain producing base construction mainly attribute to high productivity and basic development indexes such as crops sown area, cultivated land protection, ‘Gross Output Value of Farming, Forestry, Animal Husbandry and Fishery’. But the lag of agricultural modernization level stands in contrast to the achievement, because of the lack of basic agriculture input. There are many obstacles, for instance, ideas, quality, system, policies, and financing etc. The issues of “Agriculture, Farmer and Rural Area” remain challenging. Weak infrastructure, low technological level and insufficient coordinated reforms all together restrain the development of rural central and furthermore restrain grain producing base construction.

Now is the time for central China to act. In the aspect of development scale, central China should accelerate the pilot project construction, land transfer and cooperative business to expand scale; in the aspect of development level, central China should commit to strengthen scientific support, innovative service system construction, varieties of high quality research and development, try to be the first to establish ecologic agriculture standard; in the aspect of development benefits, central China should adhere to the leading status of industry, work on featured agricultural park construction, industrial hierarchy and brand impact promotion; in the aspect of development safeguard, central China should specially support basic input and projects of agriculture modernization.

### 5.2 Convert the resource-oriented strategy to market-oriented and technology-oriented strategy

Central China is well-known for its rich resources of energy and materials. Nevertheless, there are still many problems to go alongside. At first, productivity mainly relies on the primary industrial products reflecting that central China is staying in a lower energy and materials industrial level. Secondly, energy and materials industry is vulnerable in economic recession owing to contraction of demand, fall of prices and compressed profit opportunities. These are typical signs of contradiction between single industrial structure and over capacity of production. In addition, the realization of resources-priority-strategy in central China relies on resources-transformation model and decision maker neglect the importance of technical-content and market-oriented in featured industry for a long time. So, central China should convert the comparative advantage in resources to the competitive advantage in market on the basis of characteristics of development phrase and industrial structure in the future. Principles of regional division and regional exchange should be followed to maximum comparative advantage and competitive advantage when choosing priority industry carefully. Plus, region management system should be established through legislation on who is responsible to administer, who is managed<sup>[8]</sup>. how to administer and administration evaluation to promote the conversion from to

resource-oriented to market-oriented and technology-oriented development model.

### **5.3 Build modern equipment manufacturing and high-tech industry base**

In comparison with other three main regions in China, level of modern equipment manufacturing and high-tech industry base in central China is behind eastern China and northeast old industrial base, just better than western area. With regard to industrial level, modern equipment manufacturing and high-tech industry base in central China is at the stage of middle and low level, development in various industries is not inharmonious and enterprises lack core competitiveness. Moreover, size of high-tech industry is too small; leading enterprises is too little and regional development is uneven in central China. Besides, high-tech industrial plans are convergent which cause the lack of features in development zones and the homogeneity of production structure. Thus, central China should increase the intensity of support to promote the technical transformation of key enterprises and construct modern equipment manufacturing and high-tech industry base with ability of independent innovation. Relying on key enterprises, central China should focus on clean and efficient power generation equipment and focus on high value-added ships and supporting industry etc. According to national policies, central China should strengthen cooperation with universities, scientific research institute and enterprises to accelerate transformation and commercialization of research achievements, to develop comparative high-tech industry clusters.

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## On Strategies and Practical Approaches for College Students' Integrity Education in the View of Game Theory

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**Abstract:** This paper uses the game theory to research on the college students' integrity education, it put forward two Strategies for reducing the cost of the college supervision and the benefit of college students choosing to behave in the manner of integrity; enhancing the benefit of the college supervision and the cost of the college students choosing to behave in the manner of integrity in order to carry out effective Strategies on the college students' integrity education. It constructed four effective practical approaches to carry out integrity education of the college students: horizontal collaboration, vertical interaction, implicit recognition, restriction and guidance.

**Key words:** Game theory; Integrity education; Strategies; Practical approach selection

### 1 Introduction

The research performed by the West on integrity in early times mainly focused on the philosophy and religion, of which the codes of ethics and conduct as a concrete type of expression made up most of the ethical codes. In ancient Greece and Rome, integrity converted from a moral standard into a legal form. In the view of the West society, integrity, usually thought of as an instrument, crystallized as a social contract. Mostly it emphasized others' evaluation and correction for the individual integrity, which pointed out the direction for the western research on integrity. The integrity education in the West stressed much on the personal experience of integrity in favorable circumstances or adversities, the decision process of integrity selection, and the consistency among the subjective desire, the language commitment and the action.

The origin of ethical values in China can be traced back at least to ancient time, many famous masters have left lots of masterpieces on integrity. While most of the Chinese traditional ethical values rely much on the people themselves to rethink profoundly their own behavior, whether good or not. Current diverse trends are much likely to lead a group loss in the deadline of integrity. The integrity loss among college students reflects the conflict between the social education and college students' attitude towards integrity. Now the researches on integrity among college students mainly consist of the innovation in the methodologies and perspectives of the research, the present condition and different categories of integrity loss among college students, the integrity speculation among college students and its philosophical foundation. The use of game theory is rarely observed to research on the integrity loss. This project intends to use game theory for reference to analyze the integrity education among college students in order to explore the best strategy for the integrity education among college students and the best approach to further improve its relevance and effectiveness.

### 2 Deductions: Analysis on Costs and Benefits of the Integrity Education Among Chinese College Students in Matrix

In today's market and economic conditions, people are motivated to the maximization of interests. For contemporary college students, also costs and benefits are concerned in the process of the maximization of interests, which is particularly reflected in the dynamic process of value selection that college students should be honest or not. Because each individual tends to low-cost and high-yield, the establishment of mathematical model between the college supervision and the costs and benefits of college students' ethical behavior by the use of game theory is bound to facilitate colleges to effectively implement strategies and select practical approaches.

Due to the fact that either the college or the student individual has to concern benefits and costs during the course of school supervision and credit behavior respectively, this can be seen as a game event under a particular condition. Based on individual choice theory, if individuals choose their own interests as a starting point to take action, all individuals will be betrayed. On the basis of group selection theory, if the individuals put priority to the group interests as a starting point to take action, then all individuals will cooperate. Based on the two theories above, assuming that the school for the

player T, students for the player F, the player T's strategy has the right to choose to supervise or not, and the player F is authorized to behave in the manner of integrity or not. The benefit of the player F to behave in the manner of integrity is C1, the cost is C2; the benefit of the player T to supervise is R1, and the cost of supervision is R2. It is assumed that as long as the player T supervises college students, the player F will choose to behave in the manner of integrity, and for each player, the benefit is higher than the cost. The probability of the player T to supervise is m, and the probability of the player F to behave in the manner of integrity is n. The following chart shows the game states of the both sides:

**Table 1 Benefit and Cost Matrix for Game of the Supervision of Chinese Colleges**

		College student (player F)	
		Integrity probability n	Bad faith probability 1-n
College (player T)	Supervision probability m	(R1-R2 , -C2)	(-R2 , 0)
	Non-supervision probability-m	(-C1 , C1-C2)	(0 , 0)

From the perspective of the player T, if they know college students will behave in the manner of integrity and  $R1-R2-C1$ , then the player T will choose to supervise; if they know college students will not behave in the manner of integrity and  $-R2 < 0$ , then the player T will not choose to supervise. From the perspective of the player F, if they know colleges will supervise and  $-C2 < 0$ , then the player F will certainly not behave in the manner of integrity; if they know colleges will not supervise and conclude that  $C1 - C2 > 0$  on regarding to  $C1 > C2$ , then the player F will certainly choose to behave in the manner of integrity. Therefore in this game model, the ultimate choice between the players is completely dependent on each other's strategies. There is no Pure Strategy Nash Equilibrium within it.

In Mixed Strategy Nash Equilibrium model, if analyzed from the perspective of the player T and the supervision probability of the player T is m, then probability of non-supervision is  $1-m$ . If  $F1$  and  $F0$  are respectively set as the expected revenue of the player F in the choice of integrity and bad faith, then here comes the following equation:

$$F1 = m * (-C2) + (1-m) * (C1-C2) = C1-C2-mC1; F0 = 0.$$

When the cost of integrity is probably the same as the benefit,  $T1 = T0$ ,  $C1-C2-mC1 = 0$ , then  $m = 1 - (C2 / C1)$ . Therefore, we can draw the following conclusions that when the supervision probability of the player T is greater than  $1 - (C2 / C1)$ , the player F will choose to behave in the manner of integrity; when the supervision probability equals to  $1 - (C2 / C1)$ , the player F will have random choice under the circumstances; when the supervision probability is less than  $1 - (C2 / C1)$ , then the player F will certainly choose not to behave in the manner of integrity.

From the perspective of the player F, if the probability of the player F choosing integrity is n, then the bad faith probability of the player F is  $1-n$ . If  $T1$  and  $T2$  are respectively set as the expected revenue of the players T in the choice of supervising or not, here comes the following equation:

$$T1 = (R1-R2) * n + (1-n) * (-R2); T0 = -C1 * n.$$

If colleges are reluctant to supervise, then  $T1 = T0$ , or  $n = R2 / (R1 + C1)$ . Therefore, we can draw the following conclusions that when the probability of the player F choosing integrity is greater than  $R2 / (R1 + C1)$ , the player T will choose to supervise; when that probability of the player F is less than  $R2 / (R1 + C1)$ , the player will choose no supervision; when that probability is equal to  $R2 / (R1 + C1)$ , the player T will have random choices under the circumstances whether to supervise college students.

Derived from the above we can draw the following conclusions, the probability of  $1 - (C2 / C1)$ , with which player T exercises supervision, shows a negative correlation with the cost of the player F choosing to behave in the manner of integrity, a positive correlation with the benefit of the player F to behave in the manner of integrity; the proportion of  $R2 / (R1 + C1)$ , with which the player F will choose to behave in the manner of integrity, shows a positive correlation with the cost of college supervision, and a negative correlation with the benefit of college supervision together with the benefit of the player F choosing to behave in the manner of integrity.

### 3 Conclusions

Based on the cost-benefit analysis and the examine of the integrity education among college students in the view of game theory, we reach the following conclusions: the higher the cost of college supervision, the greater the probability for college students not choosing to behave in the manner of integrity; the greater the benefit of college students not choosing to behave in the manner of integrity,

the greater the probability for college students not choosing to behave in the manner of integrity; the higher the benefit of the college supervision, the probability of colleges choosing to supervise will also increase accordingly. Based on the conclusion of the analysis above, for the implementation of the integrity education among college students, we should focus on the following ways: reducing the cost of the college supervision and the benefit of college students choosing to behave in the manner of integrity, enhancing the benefit of the college supervision and the cost of the college students choosing to behave in the manner of integrity. Specifically, we have to focus on implementing the following aspects: horizontal collaboration – combination of the classroom education and the extracurricular activities; vertical interaction – combination of the phase education and the long-term education; implicit recognition - the combination of self-education and self-management; restriction and guidance – the combination of sound system with multi-level collaboration.

### **3.1 Horizontal collaboration: a combination of the classroom education and the extracurricular activities**

The college is the main front of the advanced culture which is an important part of the culture of the socialism with Chinese characters. Integrity should be the mainstream and the main theme of the advanced culture of the college and the university. We should create a harmonious atmosphere of “everyone in good faith, everything in good faith”, grasp the important principles of combining classroom education with extracurricular education, succeed in combining the recessive education with the dominant education, and the integrity education with the moral education so as to achieve a variety of horizontal collaboration among different education models. Through classroom education we are supposed to instruct students of the basic knowledge of the law and the traditional Chinese virtues to make them clear that the ancient sages as well as the modern great men are all the models of integrity and tell the students they ought to internalize honesty and credit; through various forms of content-rich and extra-curricular activities, such as, integrity education speech contest, integrity education sitcom competition, micro-film of integrity education contest, integrity education graffiti contest, the integrity education has always played a important role in the college education, we make sure the integrity education has always played a important role in the college education, during which college students accept integrity education in a way of entertainment and develop good integrity habits and cultivate a good quality of integrity.

### **3.2 Vertical interaction: a combination of the phase education and the long-term education**

The basic principles of philosophy reveal the basic law of development: there is a law for development. The development path of anything is forward and twisting. The success can not be achieved once. The integrity education among college students is no exception. Integrity Education should include both long-term planning and short-term planning formulated for the integrity education of different college students of different grades. The long-term integrity educational planning focuses on the common integrity standard and the holistic integrity education; the phase integrity educational planning is made for students of different stages. And the integrity education is subdivided into several kinds of curricula. We pay more attention on the professional integrity education for the students who are seeking jobs, the learning integrity education for freshmen, and the economic integrity education for the undergraduates. Through the integrity education with the prominent common characters and personality taken account, colleges combine the phase education with the long-term education, strengthening the relevance and effectiveness of the integrity education.

### **3.3 Implicit recognition: a combination of self-education and self-management**

The ultimate goal of the horizontal collaboration and the vertical interaction is to help each individual college student internalize the integrity education with the help of the combination of the long-term education and the phase education and the combination of classroom education and extracurricular activities. A type of exam with no invigilator is now widely respected among colleges, in which the ex-post monitoring mechanism is used. If two exam papers are almost the same, their scores of the test will be recorded as zero. As a result, it can be a good way to enhance the cost of bad faith of college students. Because when the individual is cheating, he or she will also at the same time think about how to cope with the pressure of public opinion from all the candidates in the classroom. And once this type of exam works well, it will bring students a positive personal experience of integrity, with which none of integrity can be matched. As a conclusion, to combine the self-education and self-management is particularly crucial to the integrity education among college students.

### **3.4 Restriction and guidance: a combination of sound system with multi-level collaboration.**

The explicit system of the integrity education mainly takes responsibility of the combination of system construction and multi-level collaboration. According to the results of the West study on

integrity, a sound system is effective in the constraints of individual behavior and guiding individual integrity. On one hand, because the integrity file is one part of each individual student's file, employers can check it themselves. Once acts of bad faith of each individual student are recorded, the cost of bad faith and the integrity probability will be greater. On the other hand, the integrity education among college students is supposed to be a complete system, which must be implemented both within inside and outside homes and colleges, university and external environment, multi-level collaboration. Governments, institutions, enterprises and other employing units have to recognize integrity files and recommend that integrity files should be associated with bank loans systems and bank credit evaluation systems.

The integrity loss affects the quality of the higher education and the public recognition towards college students. The benefit-cost analysis of integrity in the view of game theory facilitates the revelation of the economic law behind this phenomenon, which can be taken as a reference for the integrity education and selecting practical approaches. By the means of horizontal collaboration, vertical interaction, implicit recognition, and restriction and guidance, the cost of the college supervision and the integrity benefit can be decreased, while the benefit of the college supervision and the cost of integrity benefit can be enhanced so that a harmonious atmosphere of "everyone in good faith, everything in good faith" will be created through the implementation of this integrated, comprehensive integrity education.

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## On Family Education Between China and America and Children's Innovation Capacity\*

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**Abstract:** In an era of knowledge-based economy, innovation capacity has become the core competitiveness of one country. And the key element of innovation capacity is innovative talents whose development greatly relies on education, especially family education. This paper, by making a comparative study of Chinese and American family education and analyzing their features, merits and demerits, illustrates the worrying phenomenon that Chinese children lack innovative spirit under the influence of Chinese family education, and offers some suggestions to cultivate Chinese innovative talents by learning from American family education.

**Key words:** Innovation; Innovative talents; Family education; Cross-cultural study; Survey method; Comparison

### 1 Introduction

Innovation is the soul of one nation and an endless motive force for the growth and development of one country. The key element of innovation is talents whose growth depends on education. In 2009, a survey conducted by International Assessment of Educational Progress in 21 countries around the world showed that Chinese children's imagination ranked last and innovation capacity ranked fifth from the bottom. As a systematic education project, the cultivation of innovative talents includes family education, social education, and school education. According to a research, during an individual's growth process in China, family education takes up 70% of the entire education with school education and social education occupying only 20% and 10% respectively; while in America, family education accounts for half of the entire education and school education as well as social education constitutes 20% and 30% respectively. Therefore a good family education is extremely important for the cultivation of innovative talents.

At present, the related researches home and abroad mainly target on innovation and family education respectively, and few involve both aspects. J. P. Guilford, an American psychologist, first proposed the concept of "divergent thinking". He thus associated divergent thinking with creativity, appointing its several characteristics: fluency, flexibility, originality, elaboration. And he also designed a set of specific measurement methods. Based on the theories and methods of J.P. Guilford and considering China's national conditions, we designed the Questionnaire on Cultivation of Children's Creativity in Chinese Family Education. We carried out the survey within the Wuhan City in Hubei Province in China and distributed the questionnaires according to the different levels of the students. The questionnaire is divided into 5 levels: Grades 1-3 of Elementary School, Grades 4-6 of Elementary School, Grades 1-3 of Junior Middle School, Grades 1-3 of Senior Middle School, and Grades 1-4 of University. Each level has 20 questions, covering fluency, flexibility, originality, elaboration and sensitivity elements. A total of 16,000 copies of questionnaire were issued and 14,720 copies were withdrawn, of which 14,056 were valid, accounting for 95.5%.

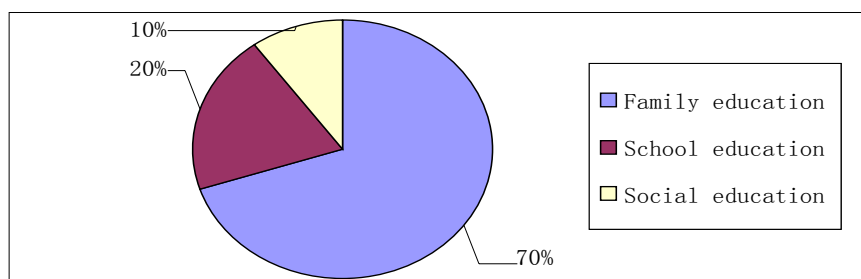


Figure 1 Individual Education in China

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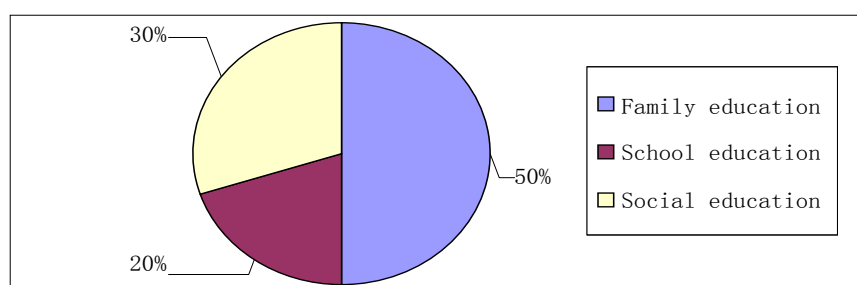


Figure 2 Individual Education in the U.S

## 2 The Similarities in Chinese and American Family Education

### 2.1 Emphasizing family education

According to the statistics in Figure 1 and Figure 2, we can learn that although the proportions of family education in China and in America are different, family education still enjoys the largest distribution in both countries. In fact, no matter in which country children were brought, families are always considered as their first school and parents are regarded as children's first teachers. Therefore, family education enjoys the most fundamental role in children's education in both China and America

### 2.2 Sharing similar contents

In the first place, Moral value is the motive force of human behavior belonging to the culture of the whole human beings. In fact many countries hold the identical moral views, although they have been taught by different stories and traditions in different cultures. In both Chinese and American family, moral education all along is the key point. Forming under the different cultural backgrounds, Chinese and American morality has different tones and implications. But some qualities have the same core and are the reflections of universal human morality, such as love, kindness, sympathy and so on. In the second place, knowledge is the primarily important force that directly decides national prosperity and personal success. Books are the accumulation of knowledge and experience, which needs us heritage and develop by study. Therefore, the family education of both countries stresses study deeply. In the third place, Hardworking and thrifty are the traditional Chinese virtues. They relate closely with self-cultivation, morality as well as the whole country's future. As an economic super power, America never slackens the thrifty education. The parents develop and temper the children's will power in order to make them adapt themselves to circumstances and enable them to develop competence of independence.

### 2.3 The role of parents in family education

No matter in China or America, parents play different roles in family education. In both countries, mothers are described as the main caregiver and they take care of children's daily life and are responsible for children's emotional education. While fathers are responsible for children's intellectual education and provide material protection for the family, so fathers are usually stricter in the eyes of children. Moreover, although mother and father have different roles in family education, both of them serve as their children's role models and parents' daily words and behaviors are more effective than some instructions in educating children.

## 3 The Differences Between Chinese and American Family Education

### 3.1 The comparison of purpose in family education

Because of the different value orientation in China and America, their specific purposes in family education also have different emphasizes. The purpose in China's family education is extremely utilitarian, which tends to focus on whether their children can achieve something or find a decent job in the future. Based on this purpose, China's family education emphasizes on children's acquisition of knowledge and skills, and the children's ability to live independently, but their ability to adapt to the life in the future are rarely considered. As a result, driven by this purpose, some Chinese parents will ignore children's unique ability, which may contribute to the destruction of children's innovative ability and imagination.

On the contrary, American parents emphasize on their children's acquisition of various abilities to adapt to the society. On the basis of this concept, they attach great importance to their children's exercise from a very young age and believe that children's growth mainly depends on their own strength, so

American parents pay attention to cultivate children's self-awareness and ability to live independently. The exercise mentioned above can be explained in a broad way, including body exercise and the exercise of the will, but the most fundamental meaning is the exercise of ability to adapt to diverse harsh environments and to work. In addition, the purpose in American family education values the process and pursues the development of children's various abilities during the process of study. Therefore, compared with the Chinese children, American children perform better in terms of independent living and the ability to adapt to the society.

### **3.2 The comparison of content in family education**

China's family education tends to emphasize on the knowledge-based educational content which bears an utilitarian nature. Apart from schools, family education in China also plays a vital role in children's knowledge education, which means children have to continue their study at home. And another performance of utilitarian education of cultural knowledge is that if children are weak in learning cultural knowledge, parents will chose a skill for their children to learn, such as playing instruments, dancing and painting. However, most parents do not value the positive influence of art on their children, but only treat art as an advantage to help their children to be admitted to a first-class school. Therefore this is a variant and expression of utilitarian education of cultural knowledge.

By contrast, American family education focuses on the cultivation of social practice and the ability to survive. Thus, in America, it is extremely important to educate children about the awareness of independence. Furthermore, American parents believe that children should learn how to manage and use their money wisely which is favorable to cultivate children's financial awareness and the ability to manage finance, and children's financial ability is related to their career and family happiness. Moreover, in the process of children's growth, American parents will leave children enough self-space and pay attention to children's psychological health. Hence, they put an emphasis on emotional communication with children and care for children's psychological needs.

### **3.3 The comparison of style in family education**

There are generally three styles of family education, which are Authoritarian style, Permissive style, and Democratic style.

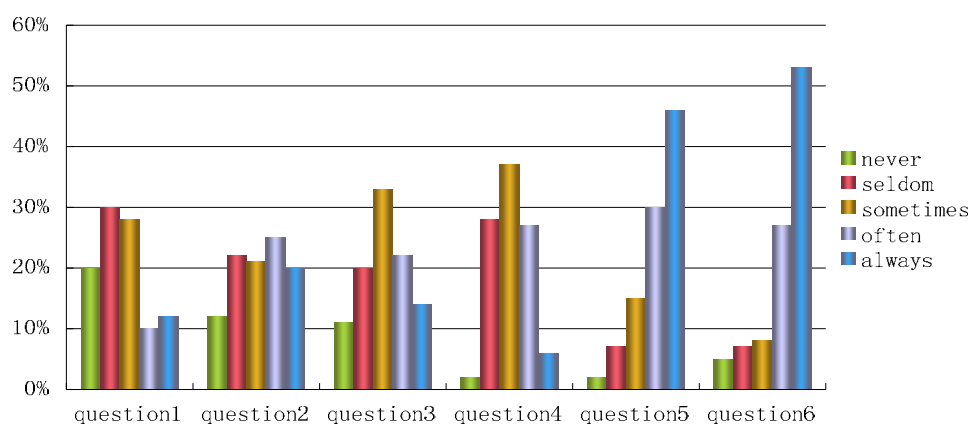
Western scholars define traditional Chinese family as "Authoritarian Style" and "Permissive style" while family in Europe and America as "Democratic Style" according to family member relationship. As for Authoritarian Style, influenced by the traditional family concepts, Chinese parents always represent authorities, staying at the core of the whole family. For instance, in the questionnaire, there is a question from the group Grades1-3 of Elementary School, saying "Do you guide instead of reprimanding your child when you find him (her) ransacking boxes and chests to see what is inside?" Only 12% of the parents choose that they would always guide the children; while half the parents choose that they would never or seldom do this. Besides, Chinese family education puts an emphasis on relation between parents and children, and parents always regard their children as part of their possessions; therefore, parents tend to provide their children with immense care and overprotection, this family education is called Permissive style. The following question for university students in the questionnaire will illustrate this point, and the question is that "When resting at home, your parents ask you to bear some housework." The response to this question is that more than half of the interviewees choose the option "seldom" and "sometimes", however, only 6% of interviewees choose the option "always". What's more, a large number of Chinese parents will satisfy every request of their children in terms of money, and the same even goes for some low-income families. Currently, an increasing number of Chinese families have been aware of the drawbacks of Authoritarian and Permissive style of family education and tend to adopt Democratic one which is most conducive to the cultivation of children's innovative spirit.

By comparison, American family pays attention to democracy and equality. The democratic and equal way of education in the American family is mainly manifested as follows: children have the right to choose and the right to express his opinion or idea freely; American parents and their children are like friends and they can communicate equally. However, sometimes too much democracy leads to indulgence in many American families. Especially in recent years, the divorce rate in American family is rising, and children cannot get enough care and education in the single-parent family, and this is an important reason for many American children to misconduct or even commit crimes. Additionally, in America, parents' care and concerns for children is limited in an appropriate range and they will not arrange everything for their children.

The following is 6 typical questions representing three styles of family education in the questionnaire and their results:

**Table 1 Questionnaire**

	Question	Result				
		Never	Seldom	Sometimes	Often	Always
Authoritarian Style	Do you guide instead of reprimanding your child when you find him (her) ransacking boxes and chests to see what is inside?	20%	30%	28%	10%	12%
	Your parents don't interfere with the way you arrange your holiday life; they think reading and hanging out with friends are both a kind of study.	12%	22%	21%	25%	20%
Permissive Style	Do you require your child to do room cleaning or sort clothes regularly?	11%	20%	33%	22%	14%
	When resting at home, your parents ask you to bear some housework.	2%	28%	37%	27%	6%
Democratic Style	Do you let your child make his(her) own study and life plans?	2%	7%	15%	30%	46%
	Do you respect your child's interests and help him(her) choose the university and major he(she) likes?	5%	7%	8%	27%	53%



**Figure 3 Results**

## 4 The Implications of American Family Education on Cultivating Children’s Innovative Capacity

### 4.1 Updating the concept of family education and fostering innovative awareness

In America, parents have mutual relationship of equality with their children, and parents always adopt the democratic concept of family education. Democratic style of education is a relaxing and comfortable education, and possesses a good number of advantages: on the one hand, it helps to foster creativity. Relaxing and comfortable conditions are rather important for stimulating children's creativity. Hence, in a happy and peaceful family atmosphere, the creativity of children is most susceptible to stimulation and it is also easier for parents to establish an equal relationship with children. On the other hand, it helps to form a healthy personality of children. If children are given the right to express their idea, to involve and to choose, they can participate in the family affairs with confidence and responsibility and actively voice their opinions. In addition, this relationship can inspire children to share their secrets with their parents. At the same time, the parents can understand their children, thus urging the children to form a good personality.

### 4.2 Emphasizing the comprehensive development of children and promoting innovation capacity

Family education should provide children with rich knowledge, especially the knowledge that does not appear in the textbooks. American parents pay more attention on children’s comprehensive development. On comparison, Chinese parents tend to lose sight of it. Therefore, in order to change this situation, parents are supposed to offer children different educational contents based on different age groups to which their children belong to. First of all, as for the children in the primary stage, the most obvious feature of education is that the systematic study takes the place of the innocent games and

becomes the dominant activity of children. At this stage, the most important thing is to stimulate children's curiosity and thirst for knowledge, and help them develop keen observation and rich imagination. As a result, parents should encourage children to go out and find some interests in their surrounding environment, because interest is a necessity for the development of innovation and without interest, one can hardly gain some inspiration. Secondly, concerning middle and high school children, parents should motivate them to expose themselves to society and gain the knowledge through hands-on experience in order to perfect their own character and prepare for the independent university or college life. Nowadays, however, most parents emphasize too much on knowledge for utilitarian purpose which is a blind action to stifle children's talents. Finally, as to children in the universities or colleges, parents should give free rein to their children and stimulate them to be more aggressive, less inert and encourage them to master the professional knowledge of their majors and to become less timid and hesitant.

#### **4.3 Cultivating children's ability to think independently and creating innovative atmosphere**

American parents attach great importance to cultivate children's ability to think independently and to create innovative atmosphere at home. And as for Chinese parents, it is worth learning from. Therefore, parents should actively provide or create the conditions conducive to the children's development of innovative qualities, so children are able to develop the habits of daring to say, to think and to do in a free, democratic and active psychological atmosphere from an early age. Moreover, parents should also give their children the opportunity, right, environment and time to be alone and the freedom to develop. Parents are supposed to respect their children's individuality, and encourage their originality and diversity.

### **5 Conclusion**

In summary, because of the fierce competition in the international market, building an innovative country seems to be the only choice for us in order to prosper in the world, and the key of constructing such a country lies in the cultivation of innovative talents. In the process of cultivating innovative talents, a correct, complete and scientific family education is very important. Due to the influence of values, history, culture and other factors, China and America formed their own distinctive family education styles, and the results of their education are quite different. Thus, this paper attempts to make a comparison between Chinese and American family education, analyze the characteristics, advantages and disadvantages of these two countries' family education and make several suggestions on Chinese family education by learning from American family education in the hope that Chinese family education will become more scientific and perfect.

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# Analysis on Cyber Language from Economics of Language

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**Abstract:** With the popularization and promotion of network, cyber language is born as a new type of language phenomenon. Cyber language follows certain principles of Economics of Language. The paper analyzes the economic and non-economic aspects of cyber language and also its economic features in cost, utility, benefit and value from the perspective of Economics of Language.

**Key words:** Cyber language; Economics of language; Least of effort; Economic features

## 1 Introduction

Economics of Language is an interdisciplinary subject of linguistics, economics, education, informatics, demography, statistics and ekistics. The concept of Economics of Language was first proposed by Jacob Marschak, a pioneer of information economics, in 1965. He argued that as an essential tool in human economic activities, language had the same economic features like other resources, value, utility, cost and benefit.

Researches on Economics of Language can be divided into two aspects: broad sense and narrow sense. Economics of Language in broad sense examines the economic outcome of language, mainly referred to the relationships between language and information, language and human capital, language and economic growth and so on. While in narrow sense, Economics of Language studies language itself.

Some theories have already taken shape in Economics of Language field. The Value of Languages with F.de Saussure as representative; the Maxim of Quality in Grice's Cooperative Principle; Principle of Least Effort by Zipf; Leech's Economy Principle and Principle of Rationality put forward by Lasher are all milestones in the research field of Language Economics. The emergence and development of cyber language are both involved with these theories.

In a long time, scholars in and abroad have been making researches on language from the perspectives of the structure, the use, the social function and the development of language. With the progress of economic globalization and cultural industrialization, language is more and more connected with economy as an essential part of culture. A few linguists begin to study the economic principles of language as well as the utility and value of language. In the latter half of 20<sup>th</sup> century, the cross of economics and linguistics led to the birth of Economics of Language. After human society enters the 21<sup>st</sup> century, a large quantity of cyber language emerges with the rapid development of network. Cyber language is a new language form which differs from traditional language. The formation and development of cyber language reflects the current development of society, politics and culture. The paper is going to analyze the economic features of cyber language from the perspective of Economics of Language.

## 2 Economic Cyber Languages

In computer-mediated communication, time-saving, trouble-saving, brevity and celerity have become the first pragmatic principle. Therefore, lots of cyber words show the principle of least effort in word formation.

### 2.1 Frequent use of acronyms

Acronym is a word formed from the initial letters or parts of a series of words. Generally, the acronyms can be divided into two types: Chinese Pinyin and English abbreviation.

Lots of Chinese acronyms are created by taking the initial letters of the corresponding Pinyin of Chinese character. For example, CJ(纯洁, chun jie), JP(极品, ji pin), LP(老婆, lao po), BT(变态, bian tai), and so on. Apart from initial letters of Chinese character, English abbreviations also prevail in cyber word. Words like ASAP(as soon as possible), BTW(by the way) and DIY(do it yourself) have already been accepted in English language but more frequently used in cyberspace.

### 2.2 Common use of homophones

The popularization of homophones is the result of time-saving. Precisely typing Chinese characters will slow down the speed of communication, so in the specific cyber language environment, based on no violation of the delivering of information, this kind of mistakes are usually accepted, even imitated. The

most typical Chinese homophone might be “斑竹”. As a new word, “版主” was not included in the vocabulary of pinyin input methods, so when someone entered “banzhu”, the first word appeared was an existing word “斑竹”. To pursue the high-speed of word-inputting, “斑竹” was used to replace “版主”. Other words like “河蟹(和谐, harmony)” and “杯具(悲剧, tragedy)” are also very popular in cyberspace. In addition to Chinese characters, homophones of numbers and English letters are equal common. An English letter may stand for the word. For example, U=you, B=be, R=are, C=see. Sometimes a sentence can even be expressed by several letters. ICQ(I seek you) is a typical example. Other than letters, numbers are also used in the formation of cyber words. For instance, 2gether(together), 4ever(forever), L8R(later) in English pronunciation, and 88(拜拜, goodbye), 520(我爱你, I love you), 9494(就是就是, I agree) in Chinese pronunciation.

### 2.3 Wide use of code-mixing

Code-mixing is a special phenomenon which combines different languages or even dialects together. For example, the mix of Chinese and English, “郁闷ing” means the speaking is depressed right now. “-ing” is the suffix of the progressive tense in English and it is borrowed by Chinese netizens to express the current status or action. “很可爱的说” is a mix of Chinese and Japanese. “...的说” is a modal particle in Japanese. Except for the foreign languages, dialects have been mixed in the formation of cyber language, too. For example, in the sentence “昨天我有去 shopping”, “有” is put before the verb, and this is a unique speaking habit in Fujian-Guangdong areas.









### 2.4 Abundant use of emoticons

Emoticons, short for emotional icons, are small pictures generally composed with punctuation marks, English letters, Arabic numerals, mathematic operators and other keyboard characters.

Some emoticons show emotional facial expressions. The following table includes some examples.

Emoticon	Meaning
*^_^*	smiling shyly
(T_T)	crying
:-O	surprised
≧◇≦	moved
( \$ _ \$ )	Greedy for money
(-_-)	Hearing nothing
*^(^_^)*	cheering up
@_@	puzzled
:-(	unhappy

Apart from the symbolic emoticons, many emoticons now appear as pictures in chat rooms and BBS, and netizens can just click the mouse to choose the emoticon they need. The following table is consisted of several typical picture emoticons.

Emoticon	Meaning
	smiling
	Saying goodbye
	Sweating
	Sleepy
	Unhappy
	Surprised
	Shy
	Fighting
	Ok

This kind of cyber words is visualized and humorous, and they can be regarded as a new type of hieroglyph.

All the formation methods of words above are creative simplification, aiming at the optimization of

language configuration.

### 2.5 Economic feature at the level of syntax

In addition to the lexicon, the syntax of cyber language also shows the economic principle. Some economic feature of cyber language reflected greatly in syntax, mainly manifested in the use of abbreviated language. This kind of language obviously embodied the features of the requirements of quick response and the high efficiency of network. The condensation of cyber language can be divided into two types: the omitting of grammar usage and the compression of sentence.

#### ① Omitting of some grammar usage

Cutting certain parts of a complete sentence is the omitting of some grammar usage. The omitted parts can be subjects, objects, attributes and so on. Language of grammar usage omitting has its own feature. To understand the exact meaning of the sentence, one has to combine the given language environment, and add the missing parts according to the relationship of the context and the judgment of own experience. This is mostly the same with our daily oral communication; therefore, this kind of language is common to see in chat rooms and BBS. For example:

Chatter A: 干嘛呢? (你在干什么? What are you doing?)

Chatter A: 午饭 ing (我正在吃午饭。 I am having lunch.)

Chatter B: paper 搞定了? (你的论文写完了吗? Have you finished your paper?)

Chatter A: 木有 (还没有写完。 Not yet.)

Chatter B: 几时交? (什么时候交论文呢? When are you going to hand it in?)

Chatter A: 唔知 (我不知道。 I've no idea.)

This kind of conversation is not uncommon in network, abounding in expressiveness and a high degree of colloquialism. Many constituents are omitted in the dialogue. Others need to be familiar with cyber language and acquire good cultural background knowledge to understand it.

#### ② Compression of sentence

Apart from large quantity of acronyms, compressive sentences are also common to see in cyber language. Compression of sentence is a relatively canonical abbreviated coding form. It follows certain rules, and the compression of sentence can be divided into compression of Pinyin, compression of English and compression of numbers.

The features of compression of Pinyin lie in spelling the pinyin of a sentence or phrase in Chinese, and then combining the initials of each. For example, "PLMM" refers to "漂亮美眉 (beautiful girls)". BRB(马上回来, be right back), IMO(在我看来, in my opinion), JAM(等一会儿, just a moment), BTW(顺便说一下, by the way), MORF(男性还是女性, male or female), CULT(回头见, see you later) are examples of English compression. Features of English compression and Pinyin compression are almost the same, except the way in which the compression of English is more flexible. CULT is not exactly the combination of initials; it adopted the way of using partial tone.

Compression of numbers is using a set of figures to replace a sentence. For instance, "5460" means "I miss you"; "7456" refers to "you piss me off"; "888" means "see you around". To understand the meaning of these figures, one has to decode from the perspectives of the pronunciation of Arabic numerals, musical notation, telegraph code and the like.

## 3 Non-Economic Cyber Languages

As we can see, most cyber language follow the economic principle at the level of lexicon and syntax, however, it is also common that the formation of some cyber words violates the principle of least effort.

### 3.1 Deformations of Chinese characters

Adding components of Chinese characters and spiting components of Chinese characters are the two forms of deformation. For example, "娥媿(我是 I am)"; "迺菘(西瓜 watermelon)"; "弓虽(强 strong)" and "丁页(顶 support)". This is a word game. Sometimes special software is needed to type in these words, which sets handicap in entering. Obviously, this kind of word formation is not economic.

### 3.2 Popularity of ancient Chinese character

Wide use of "囧" and "槩" is a typical example. "囧" was firstly seen in inscriptions on bones or tortoise shells of the Shang Dynasty. The original meaning of the word is light. However, in cyber space, the meaning of the word has been transferred to "I can't stand it; you defeated me". The character is usually used to express an emotion of sadness or gloomy, or the situation that is awkward or frustration. "槩" is the same with "梅" in pronunciation and meaning, referring to plums opened in early spring. But



the word is used to describe a person who is very dull in network. Except the ancient Chinese characters, the original complex form of a simplified Chinese character is also used sometimes. Use of these characters has a tendency of throwing back or returning to the ancients.

### 3.3 Word concept conversions

In the environment of network, many words are separated from their original meanings, and new concept, even totally opposite meanings are given.

The original meaning of “腐败” is a phenomenon in which a behavioral agent abuses his or her power to satisfy his or her own benefits. However, “腐败” has become a pronoun of enjoying life, shortened into “FB”. In cyber space, “腐败” refers to some one asking some strangers who share the same interests to have beer and skittles together through network, blog, BBS, QQ, MSN and so on when he or she is bored or alone. “贤惠” refers to a woman who is kind, obedient, understanding and reasonable, good at managing a household and knows how to photograph husband godchild. The meaning of “贤惠” in network has been changed into “闲在家里什么都会”, which means doing nothing at home and is quite different from its original meaning.

This type of new cyber words usually puzzles netizens who see these words for the first time, and they bring trouble in understanding. Apparently, word concept conversions violate the economic principle.

Violation of economic principle does not only show in the formation of cyber words, but also on the delivery of information. Some “Wulitou” and “zero language valued” sentences are often used. Netizens like quoting the lines in the movie *A Chinese Odyssey*. For example, “曾经有一个暴利的机会放在我面前,我没有珍惜,等我失去的时候我才后悔莫及,人世间最痛苦的事莫过于此。如果上天能够给我一个再来一次的机会,我会对那支股票说三个字:我买你。如果非要在这次交易前加上一个数量,我希望是……十万股!” The information this passage delivered is that the speaker regrets he didn't buy the stock. According to the Maxim of Quality in the famous Cooperative Principle of Grice, the amount of information this passage carried is far less than the amount it is expected to carry.

## 4 Economic Features of Cyber Language

### 4.1 Cost of cyber language

Emergence and popularity of internet infuse new life and energy into people's political, economic, cultural lives. Vice versa, many cyber phrases are created based on the development of politics, economics and culture.

“河蟹”, a very popular cyber word, is created because of certain political element. “河蟹” is the homophone of “和谐”. Because Communist Party of China carries out the policy of “harmonious society”, and often delete the derogatory information or reports by taking it as the reason. So netizens take “” as the behaviors of blocking or covering derogatory information. Meanwhile, the word contains a pun meaning of a crab running amuck.

Rapid development of culture industry, especially film and entertainment industry brings us more and more colorful cyber phrases. One of the top 10 cyber words in 2008, “打酱油”, comes from an interview of a news in entertainment industry. A citizen in Guangzhou was interviewed of his opinions of nude picture scandal, and he answered: “关我鸟事,我出来买酱油的”. Then the phrase “打酱油” began to have a great vogue in cyber space. In internet, “打酱油” refers to the behaviors not talking about sensitive topics, not talking about politics.

Besides, some cyber words come from regional culture features. In the push of bagatelles of Mr. Zhao Benshan, some dialects with vivid northeast features begin to spread in network, in which “忽悠” is a representative word. Meantime, some cyber words are created from the pronunciation of dialects. For example, “灰常” is the pronunciation in Fujian dialect for “非常”, and “淫才” is the pronunciation in Northeast dialect for “人才”.

### 4.2 Utility of cyber language

In the concept of economics, utility refers to the degree of satisfactory of one's needs or desire that achieved through consuming or enjoying leisure time. The satisfactory of desire achieved by language is the utility of language.

Using cyber language in network can satisfy netizens to some extent. First of all, using cyber language can help to cover one's identity, age, gender and codes of language. It is said that the network is a magnificent masquerade. “In the Internet, nobody knows you are a dog.” One can pretend to be

whoever he or she wants to be. There is no threshold of identity, age and gender. As long as the use of cyber language is mastered, a male netizen may pretend to be a female. Sometimes, one can use the dialect of other areas to cover his or her true location. Secondly, using cyber language can highlight one's personality and attract others' attention. The frequent use of "Mars Language" by the generation after 90s is some kind of emotional needs to be unique and go alone especially to a great extent. Many netizens like using reiterative such as "东东", "坏坏" by imitating children's talk to release the pressure as adults. Cyber language gets rid of the restriction of traditional written language, and has become an excellent tool to display ones' own personality. The funny and newfangled cyber language gives people a feeling of being in an entirely new world.

#### 4.3 Benefit of cyber language

In the early 20<sup>th</sup> century, Irving Fisher, a famous American economist, developed the theory of economic benefit. In the book *Capital and Nature of Benefit*, he analyzed the concept of benefit through the forms of benefit, and put forward three different forms of benefit: spiritual benefit, satisfactory acquired spiritually; effective yield, increase of material wealth; pecuniary benefits, the monetary value of the increased property. In the three different forms of benefit, some of them are measurable, while the rest are immeasurable.

Benefit of cyber language is mostly spiritual benefit. Despising tradition and upholding creation is a typical feature of cyber language. The passion, vogue, unique young people make their ways of expression unique. Netizens, young people based, no longer just use cyber language, many netizens create cyber language actively, and this might be one of the reasons why cyber language possesses such a thriving vitality.

Netizens may satisfy themselves by using cyber language. Meanwhile, those who see or hear cyber language can also be satisfied. Humorous sentences like "每个成功的奥特曼背后都有一个默默挨打的小怪兽", "人又不聪明,还学别人秃顶" will make people who see them smile and happy. No matter the creation, the use or the absorption of cyber language, it will bring people full satisfaction.

As a matter of fact, the use of cyber language has gone beyond network. In the Spring Festival Gala in 2010, lots of cyber words and phrases were used in opusculums and crosstalks. For example, "偷菜", "我妈叫我回家吃饭", "不要崇拜哥,哥只是个传说", "唱的不是歌,是寂寞", "雷人", "梦想很丰满,现实很骨感" and so on. These word aroused echo in audiences, especially young audiences. Professor Li Peigen, the president of Huazhong University of Science and Technology, quoted cyber language like "什锦八宝饭", "俯卧撑", "喝开水", "躲猫猫" and the like in his speech to the 2010 graduates, which has evoked people's excitement extensively.

In addition to the spiritual benefit, certain effective yield has also been brought by cyber language. First of all, using cyber language saves time and money more or less. In cyber language, numbers, symbols, pinyin, characters and letters are mined together. It seems that there is no discipline, but in fact, no matter the acronyms, homophones, code-mixing or emoticons, they are easier to use, which helps to save time and even the money spent on Internet surfing. And secondly, cyber language's effective yield is now seen in our real lives. Some merchants print cyber language on their products to attract consumers, especially young consumers. For instance, there are some T-shirts with the cyber word "囧" printed on in the market. Some steamboat restaurants hang a slogan of "哥吃的不是火锅,是寂寞"(It is not the food in the hotpot the brother eats, it is loneliness he has) in front of the shop. As a result of the strong and rapid development of cyber language, more than ten books on cyber language have been published so far. Some writers also use cyber language in their novels. *A Kiss of the Evil* by Guo Ni is full of cyber language. All these can be regarded as effective product of cyber language.

#### 4.4 Value of cyber language

Value can be divided into positive value and negative value.

Through the analysis of the cost, the utility and the benefit of cyber language, it is clear to see the positive value of cyber language. The biggest feature of network is that it is convenient and quick. Therefore, quick and time-saving type in method is the object the netizens pursue. As long as it contains necessary information, the language will be simplified as short as possible. This is an irresistible tendency of the development of the language used in the network. Internet speeds up the development of society, and the rate of cultural diffusion will also be improved. New cyber words and phrases mainly rely on their own vitalities. If these active cyber words and phrases can bare the test of time, they will finally survive and be accepted by most of the netizens.

However, when the positive value of cyber language appears, the negative value appears along with. Not all the cyber words are positive and active. Some gross language also spreads in the network.

Certain cyber language is unreasonable and illogical, and even wrong in the aspect of grammar. The rules of grammar seem to be the greatest enemy to these cyber phrases and sentences. To those who seldom surf the internet, it is easy for them to get confused. In the progress of young people's personality showing off, cyber language has a tendency of vulgarization, which is a great reason why many experts and teachers appeal to make cyber language force-out. Curse language like "TMD (他妈的)", "WBD (王八蛋)" have a bad impact on the healthy development of language.

## 5 Conclusion

As a new type of language phenomenon, cyber language is full of vitality. The emergence of it demonstrates its economic value to people in modern society for it saves people's time and provides people with much spiritual satisfaction as well as working efficiency. Just as everything follows the natural principle of "survival of the fittest", cyber language, as part of our life, will exist and develop despite its shortages.

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## On Creative Ability of Chinese Youth and Its Culture\*

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**Abstract:** Nowadays, with the development of society and progress of technology, domestic and international competition becomes more and more intense. Creative ability has become an indispensable part of a country's international competitiveness, and the culture of creative talents is one of the key themes of this age of competition. School, family and society are three aspects that are crucially important in the culture of the youth's creativity. However, regarding the culture of the youth's creativity, China still has the problems of emphasizing marks too much, despising creativity and having unscientific methods of family education. This paper puts forward some suggestions from the aspects of school, family and society, hoping to solve those problems, thus helping to cultivate more creative talents required in our age.

**Key words:** Creativity; Youth; Culture; Questionnaire; School; Family; Society

### 1 Introduction

Creativity sustains the progress of a nation, and it is an inexhaustible motive force for the prosperity of a country. The increasingly fierce competition in the international market has forced us to take the route of creativity and the key and foundation of constructing a creative-typed country lie in talents and education. The fundamental task of modern education is developing and cultivating the creative ability of the youth, which requires the support of many aspects, mainly society, school, and family. Since reform and opening up, China's creative ability has been greatly enhanced and a few scientific researches and technological innovations have taken a place in the world. However, there is no doubt that relatively great disparity still exists between China's creative ability and the world's advanced level. According to the relevant analysis data in 2001, China, among 49 major countries, ranked 28<sup>th</sup> in comprehensive ability of scientific and technological creativity, this is slightly below the average level. In 2009, the question "Why cannot our schools cultivate creative talents?" raised by Tsien Hsueshen, a late outstanding Chinese scientist who is hailed as the father of Chinese astronautics and missiles, still remains to be solved, and has triggered a deeper thinking in Chinese education among Chinese people.

### 2 Definition and Evaluation of Creativity of the Youth

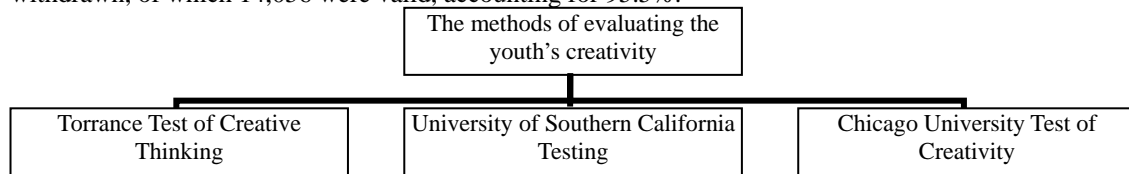
At present, a more identical view in China is that creativity is identified as an intelligence quality that, according to certain purposes, utilizes all known information to create some kind of novel and unique product with social or personal values. This definition reflects the common characteristics of creativity, but basing the measurement and evaluation of creativity of the youth merely on such a highly-generalized definition is far from enough. We must be aware of the complexity and diversity of creativity. With the deepening of the research on creative activities and the increasing demand of creative talents, a growing number of people have come to realize the necessity and possibility of measuring creativity. In 1950, J. P. Guilford, an American psychologist, delivered a well-known speech entitled "Creativity" at the annual meeting of the American Psychological Association, and since then the number of researches on creativity rises greatly, and the research methods are becoming more and more diverse. In the process of studying the Structure of Intellect and through factor analytic methods, Guilford discovered "divergent thinking", which he saw as a major component of creativity and associated with four main characteristics: fluency, flexibility, originality, and elaboration. In terms of evaluation of the youth's creativity, especially divergent thinking, there are three main methods: Torrance Test of Creative Thinking, University of Southern California Testing, and Chicago University Test of Creativity.

Based on the theories and methods of J.P. Guilford, learning from the creative tests above, and considering China's national conditions, we designed the Questionnaire on culture of Children's Creativity in Chinese Family Education. We carried out the survey within the Wuhan City in Hubei Province in China and distributed the questionnaires according to the different levels of the students. The questionnaire is divided into 5 levels: Grades 1-3 of Elementary School, Grades 4-6 of Elementary School, Grades 1-3 of Junior Middle School, Grades 1-3 of Senior Middle School, and Grades 1-4 of

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University. Each level has 20 questions, covering fluency, flexibility, originality, elaboration and sensitivity elements. A total of 16,000 copies of questionnaire were issued and 14,720 copies were withdrawn, of which 14,056 were valid, accounting for 95.5%.



**Figure 1 Three Main Methods of Evaluating the Youth's Creativity**

### **3 The Influence of School, Family and Society on the Culture of Creativity of the Youth**

Family education, school education, and social education form the vast majority of the whole education. According to a research, during an individual's growth process in China, family education takes up almost 70% of the entire education with school education and social education occupying practically 20% and 10% respectively.

#### **3.1 The influence of school on the culture of creativity of the youth**

Among the factors affecting the development of youth's creativity and exploitation of their potentials, school plays a significant role. In the Ecological Systems Theory developed by Urie Bronfenbrenner, a renowned Russian-born American psychologist, school is one of the innermost microsystems of individual existence. And school environment is an intimate, immediate, and interactive environment the individual lives in. A relaxing, democratic and secure school environment makes it much easier to stimulate creativity. In the circle of international education, whether it helps to develop the students' creativity has become a standard of measuring international quality school environment. In 2003, the World Health Organization suggested in the report "Health-Promoting School: Creating an Environment for Emotional and Social Well-Being", that one of the important qualities of a good school's psychological and social environment is to promote the students' creativity. Primary and secondary school environments are crucially important to students' creativity development. To create a favorable school environment for the development of youth's creativity, we need to use the positive factors more effectively and at the same time, pay more attention to the improvement of some factors harming, or even inhibiting the development of creativity.

#### **3.2 The influence of family on the culture of creativity of the youth**

Generally speaking, family education refers to the education for the youth given by parents or elder members of a family. It is a crucial part of the entire education system. In effect, family education is not only a family activity, but also related to the whole society. Family education is the foundation of school and social education. Thus, it can by no means be replaced by school and social education. Family is the first "school" to educate the youth and also an eternal "school" for the youth's lifelong education, while parents are the first "teachers" of the youth. First of all, for the youth, family education is the beginning and foundation of education. Secondly, the impact of family education is much greater than that of school education. As the first "teachers" of the youth, parents' words and deeds play a pivotal role in the youth's growth. Thirdly, the time that the youth spend in receiving family education is much longer than that spent in two other kinds of education. Everyone's character and way of doing things are closely related to the family education one receives. Family education influences the youth's modes of thinking, which in turn affects a person's behavior. Therefore, family education is vitally important in the process of the youth's good habit formation as well as the physiological and psychological maturity.

#### **3.3 The influence of society on the culture of creativity of the youth**

Modern society attaches great importance to the all-round development of the youth and unprecedented attention has been given to the culture of the youth's creativity. The highly-developed science and technology also provides a favorable external environment for cultivating the youth's creativity. Social educational institutions, though diversified in terms of form and activity, all exert an obviously positive influence on the youth's creativity culture.

## **4 Existing Problems in Chinese Education**

### **4.1 Emphasizing marks and despising creativity**

In 2009, according to a survey conducted by International Assessment of Educational Progress in 21 countries around the world, Chinese children's computing power ranked first in the world, while their

imagination ranked last and creativity ranked the fifth from the bottom. Among Top 20 Major Inventions Affecting Human Life released by several American professional societies, no inventions were invented by Chinese. Every year, there are as many as 2,000 Chinese gaining their doctorates in the United States, which is the largest number of non-American students who get a doctorate and doubles the number of Indian students. American experts comment that though Chinese students' performance is outstanding, their imagination is insufficient. What is worse, Chinese parents even reckon that it does not matter that their children do not have creativity or imagination, and children's performance at school is the only thing that parents care and value. And because of the influence of teachers, parents' strong awareness of educating their children independently is dampened. Family education is based on the theory of school education and modeled on school education patterns in terms of content, methods, languages and way of thinking. Many Chinese parents only cares about their children's scores, performances and whether children can pass the admission exams or not, while discarding the unique function of family education to cultivate students' creative thinking ability and imagination.

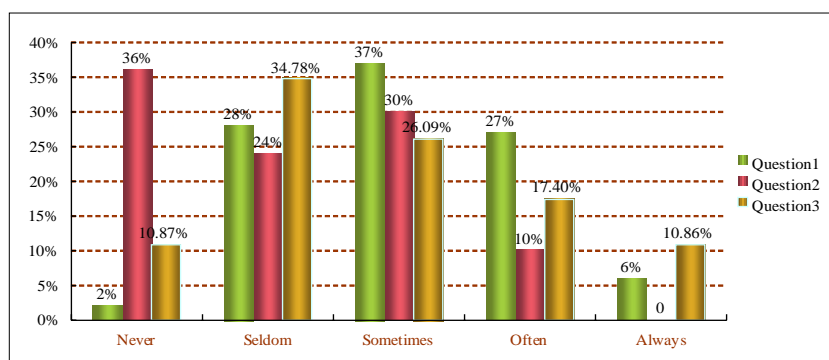
**4.2 Unscientific parenting styles**

There are three typical kinds of unscientific parenting styles in China: Indulgent parenting, Authoritarian parenting, and Neglectful parenting. The first style is Indulgent parenting whose main manifestation is that parents arrange everything for their children and pay no attention to the culture of children's self-care ability and working habit. In addition, indulgent parents are nurturing and accepting, very responsive to children's needs and wishes, and socially "overprotective". The following question for university students that "When resting at home, your parents ask you to bear some housework." in the questionnaire well illustrates this point. The response to this question is that over half of the interviewees choose the option "seldom" and "sometimes", however, only 6% of interviewees choose the option "always". The second style is Authoritarian parenting, which is characterized by the creed "spare the rod and spoil the child" scrupulously abided by parents. Authoritarian parents take severe control over their children and tend to demand obedience without explanation and focus on status. In the question "Your parents ask you to make deliberate plans for family outing or other important activities and organize it. ", 36% of university students choose that they have never made or organized such plans while none of them says that he or she always does it. The answer shows that some parents give little freedom to children. The last style is Neglectful parenting. This style of parenting is mainly manifested by that parents are generally not involved in their children's life, are disengaged, undemanding, and do not set limits. The question "Do you have a wide range of interests and often accompany your child to engage in various cultural and sports activities?" and its answer are a good example of this parenting style. Less than 30% of parents choose "often" and "always", while more than half of the parents choose "sometimes" and "seldom". Besides that, the style is also displayed by the financial indulgence. Quite a number of Chinese parents grant whatever is requested financially by children.

The following table is 3 typical questions representing three kinds of parenting styles in the questionnaire and their results:

**Table 1 Questionnaire**

Style	Questions
Indulgent	1. When resting at home, your parents ask you to bear some housework.
Authoritarian	2. Your parents ask you to make deliberate plans for family outing or other important activities and organize it.
Neglectful	3. Do you have a wide range of interests and often accompany your child to engage in various cultural and sports activities?



**Figure 2 Answers**

## **5 Suggestions**

### **5.1 School**

#### **5.1.1 Humane management**

Schools' administrators should create the conditions for establishing democracy and equality between teachers and students, encouraging respect and love among them, and making teaching benefit the students as well as the teachers. Besides, schools' administrators are also supposed to pave the way for teachers' and students' participation in schools' administration, and building democratic schools. The majority of the college students in the new era, who grow in the period of social transition, are the only children in the family. Students who were brought up in this one-child living environment are sometimes highly dependent, self-centered and afraid of being neglected. Therefore, college logistical personnel should provide a broad platform for college students' living education, carry on living education through service of high quality and enable the students to savor and appreciate the educational elements in it.

### **5.2 Family**

#### **5.2.1 To establish the correct concept of family education**

Family education, school education and social education form a education network for the youth's survival and development, and family education serves as the headquarter in the youth's growth. But now the problem is that family education's independence and special function of cultivating the youth's creative ability is being neglected and quashed. Actually family education has become an extension of school education in terms of educational contents and forms. In order to alter this situation, first of all, parents are required to establish the correct concept of family education. Secondly, parents should let family education get rid of the duplication and extension of school education, and encourage the youth to develop freely, independently and creatively in family education.

#### **5.2.2 To create a suitable family atmosphere and to encourage the youth's sense of creativity**

Sense of creativity is a psychological motivation for stimulating individuals to produce creative behaviors. Without sense of creativity, one can not engage in creative activities, and only creators with strong sense of creativity can dedicate themselves to the creativity, and then accomplish great achievements. More importantly, early childhood is the most important period of the development of the youth's creativity and parents should seize this opportunity for the youth's development.

#### **5.2.3 To enrich the family education content**

Supervising the youth to do their homework and helping them to master the knowledge required in the textbooks are part of the family education content, but not the most important ones. Family education is supposed to provide the youth with richer knowledge than school education, especially the knowledge outside the textbooks, therefore establishing the information foundation for the realization of psychological transcending. When it comes to the form of education, parents should motivate the youth to go out to visit the park, market and streets; to observe the world of nature, plant flowers and trees and raise some pets; to expose themselves to the society and then come to understand it. In this way, the youth can enlarge their exposure to the surrounding environments and broaden their horizons. Furthermore, not only can the youth have an informative understanding of things, but they can gain practical experience and emotional awareness as well.

### **5.3 Society**

#### **5.3.1 Outside class reading materials cultivating the youth's creativity**

Without the mastery of the existing scientific and technological knowledge, the youth are hard to produce creative behaviors for practical use. Even though they come up with creative ideas, they can not put these idea into practice. Accordingly, another method to cultivate the youth's creativity is to guide them to read a large amount of rewarding outside class reading materials, so that they can continue to broaden their horizons, enrich their cognitive structures and lay a solid foundation for creativity in the future.

#### **5.3.2 Social education facilities cultivating the youth's creativity**

In modern society, there are various social education facilities, such as the museum of science and technology, the museum of history and the museum of natural science. These facilities exert a positive impact on expanding the youth's scope of knowledge, cultivating their observation and enriching their perceptual knowledge.

## **6 Conclusion**

To sum up, in the fierce competition of the international market, creative ability has increasingly become an indicator of whether a country possesses international competitiveness. And the key of

constructing a creative country lies in the culture of creative talents. And school, family and society play a vital role in the culture of the youth's creativity. However, concerning the culture of the youth's creativity, China still has the problems of emphasizing marks too much, despising creativity and having unscientific methods of family education. Thus, we propose some suggestions on the culture of the youth's creativity in China from the aspects of school, family and society, hoping they will assist the society to cultivate more creative talents required in our era.

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# Research on High-Tech Enterprise Growth Mechanism in the View of Dynamic Capabilities

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**Abstract:** The essay takes “knowledge learning-dynamic capabilities-enterprise growth” as the dominant logic, thinking of the dynamic adaptability of environment-organization-strategy, dynamic capabilities of high-tech enterprises are divided into environmental insight, knowledge innovation and strategic change capacity. Interactions between dynamic capabilities and core competencies go to gain sustainable competitive advantage and to realize the firm growth. Through internal growth, M&A, the network growth and international growth, dynamic capabilities take a role in the enterprise growth and to be further improved.

**Key words:** Dynamic model; High-tech enterprises; Enterprise growth; Organization learning

## 1 Introduction

High-tech enterprises are the effective carrier which is promoting scientific and technological innovation and transformation of the achievements. Since the 1990s, enterprise development environment shows notable variability, complexity and uncertainty, especially in high-tech enterprises. Environment with these characteristics are referred to as the “dynamic environment”. This is not only the major theoretical issue, but also significant practical problem that in dynamic environment, how the high-tech enterprises obtain sustainable competitive advantage.

Dynamic capabilities theory is born out and supplies new ideas and methods for the analysis of the problem. This theory emphasizes the internal and external resources, knowledge, capabilities of integration, as well as the environment changes dynamically adapt to effectively address the core competencies of core rigidity, and thus the high-tech enterprise growth in a dynamic environment has important guiding value.

The essay takes "knowledge learning - dynamic capabilities - enterprise growth" as the dominant logic. First, analyzes the knowledge of high-tech enterprises and their growth characteristics; second, analyzes the meaning dimension of dynamic capabilities of high-tech enterprises, the mechanism of action, the path of ascension; then designs and constructs a theoretical model of the growth mechanism of high-tech enterprises under dynamic capabilities perspective.

### 1.1 The meaning of high-tech enterprise growth

(1) In terms of growth target, the growth of high-tech enterprises refer to the process that enterprises continue developing and then achieving sustainable growth.

(2) As for the growth of nature, any enterprise can be healthy and rapid and sustained growth.

(3) On the part of the growth dimension, the growth of high-tech enterprises always includes boundary growth, structure growth, behavior growth and performance growth (Jiang Ji-hai, 2007), which can be indicated by the following composite function:

$$HG = F(X, Y, Z, W) \quad (1)$$

Among them, HG: high-tech enterprise growth, X: enterprise Boundary, Y: enterprise structure, Z: enterprise behavior, W: enterprise performance.

### 1.2 The basis of high-tech enterprise growth

(1) Knowledge and resources. According to the classified ideas of tangible resources and intangible resources, resources also can be divided into knowledge resources and traditional resources, while under the conditions of the knowledge-based economy, knowledge resources in enterprise growth plays more important role than the traditional one. Also, resources can be divided into material resources and human resources. Human resources, especially high-level human resources, are both corporate knowledge and especially the tacit knowledge of the main carrier, enterprise knowledge innovation and the accumulation of important subjects.

(2) Capabilities and resources. Resources are important for enterprise growth, and static, passive, while capacities are dynamic, active. Dynamic resources are only through their role in order to have an impact on enterprise growth. Accordingly, the enterprise capability theory thinks that the relative terms of the resources, capacity is more important role in enterprise growth. Enterprises growing path is the

ability to act on the resources to achieve enterprise growth. The formation of capabilities depends on the reserved resources, and acquiring resources depends on the capability's cultivation. The enterprises' resources and capabilities interactions are complementary and indispensable.

(3) Capabilities and knowledge. High-tech enterprises belong to knowledge-intensive enterprise, which knowledge is the primary resource for their growth. Capabilities can act on the knowledge to achieve the growth of high-tech enterprises. The enterprise capabilities theory thinks that enterprise knowledge to create profits for the enterprise. Knowledge form capabilities and the capabilities configure knowledge.

In summary, the resources, knowledge, capabilities and enterprise growth have the relationship between a function expressed as:

$$HG = C(R, K) \tag{2}$$

Among them, HG: high-tech enterprise growth, R: resources, K: knowledge, C: capabilities.

### 1.3 The relation between knowledge innovation and high-tech enterprise growth

Nonaka (1991) considered knowledge innovation is the interactive process of tacit knowledge and explicit knowledge, including socialization, externalization, combination and internalization (Figure 1).

Learn from the results of previous studies, and combine with the characteristics of high-tech enterprise, we divide the process of knowledge innovation into knowledge acquisition, knowledge creation, knowledge integration, and knowledge sharing and knowledge application (Figure 2).

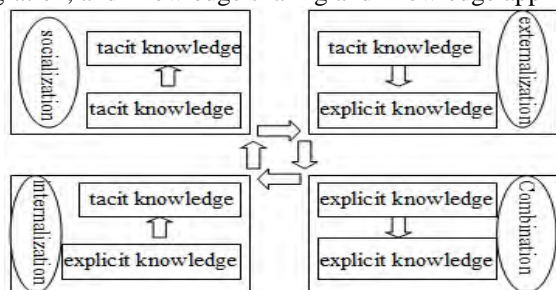


Figure 1 Nonaka's SECI Model

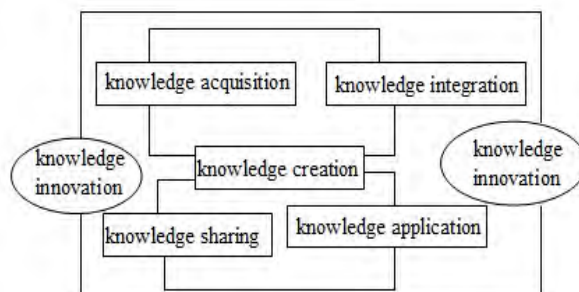


Figure 2 The Process of Knowledge Innovation Model

The high-tech enterprises are collection of knowledge, thus their growth are essentially continuous innovation and accumulation of knowledge. Table 1 analyzes the close relationship of the innovative ways of running of knowledge, intellectual property and enterprise-growing path (Table 1).

Table 1 Innovative Ways, Knowledge Running and Growth Path

Innovative ways		The connotation	The key link in knowledge running	The owners' mode of intellectual property	Basic approach of enterprise growth
Innovation	Original innovation	Efforts to obtain more scientific discoveries and important technological invention in various production areas.	Knowledge creation	Autonomous Knowledge Property	Internalization of Growth
	Integrated innovation	Related technical results converged to form a market-competitive products and industries.	Knowledge acquisition Knowledge Integration		Networking Growth Or M & A growth

	Secondary Innovation	On the basis of extensively absorb the world's scientific achievements, and actively introduce advanced foreign technology, it is fully digested and absorbed and re-innovation.	Knowledge acquisition Knowledge Integration Knowledge creation		
Cooperation and innovation		Cooperation to achieve innovation and research network, or Union.	Knowledge acquisition Knowledge Integration Knowledge-sharing	Share	Networking Growth
Introduction to imitate		Obtained from external companies lack the knowledge resources through market transactions means.	Knowledge absorption	Transaction	Market of growth

## 2 Analytical Framework of Dynamic Capabilities of High-tech Enterprises

### 2.1 The meaning of dynamic capabilities of high-tech enterprises

Teece&Pisano(1994) believed that, the dynamic capabilities are the capacity of creating, integrating and reconfiguring the internal and external capacity, in order to adapt to rapidly changing external environment. Teece, Pisano&Shuen(1997) first proposed a more systematic analytical framework of dynamic capabilities, they believe that the dynamic capabilities include the three dimensions of the process, location and path.

Learning from past research results, the essay thinks the dynamic capabilities of high-tech enterprise be the capacity of through environmental insight, knowledge innovation and strategic change to maintain the environment - knowledge - strategy to dynamically adapting.

Environmental insight capability = Environment + insight + capability. Environmental insight capability refers to the capability of enterprises to keep perception of changes in the environment. Insight refers to the capability of perceiving things or problems deeply and clearly.

Knowledge innovation capability = knowledge + innovation + capability. Knowledge innovation capability is an important part of dynamic capabilities and manifestations, and the evolutionary system of dynamic capabilities. The high-tech enterprises are high-knowledge accumulation, and rapid innovation in both enterprises and the rapid knowledge innovation capability is the most important source of sustainable competitive advantage of high-tech enterprises. Dynamic capabilities are essentially update capabilities. They have four distinct features: dynamic, learning, openness and innovation, while innovation is the most essential features of dynamic capabilities (Gong Yi-ping, 2010).

Strategic change capability = strategy + transformation + capacity. Mintzberg(1998) had defined the concept of strategic change from the two dimensions of the "change" and "strategy". This essay considers that strategic change is the process of adjustment according to the external environment and organizational status changing strategy content or strategy paradigm, in order to play to our strengths, seize the opportunity and circumvent weaknesses and threats, shows differences of the strategy content or strategy development paradigm in the different stages of development.

### 2.2 The dimension of dynamic capabilities of high-tech enterprises

According to the foregoing interpretation, the dynamic capabilities of high-tech enterprises can be divided into three dimensions: environmental insight, knowledge innovation, and strategic change.

(1) Environmental insight. The purpose of environmental insight aims to discover or predict environment that will be changes and these changes impact on enterprises, and then take effective measures to deal with. Porter believes enterprise strategic environment include four aspects of the PEST: political environment, economic environment, social environment and technical environment. According to the research purpose, the essay divides high-tech enterprise environment into macro-environment, technology and market environment. From this perspective, the capability of environmental insight includes macro-environmental insight, technical environmental insight and market environmental insight. SWOT analysis method takes into accounting the internal and external factors, and through internal environment analysis finds that the strengths and weaknesses and identify opportunities and threats by the external environment. From this perspective, the capability of environmental insight includes the advantage insight, disadvantage insight, opportunities insight and threat insight.

(2) Capability of knowledge innovation. Knowledge of high-tech enterprises mainly includes four types: technical knowledge, market knowledge, management knowledge and system knowledge. Therefore, knowledge innovation capabilities include three types: the capability of technological

innovation, management innovation and system innovation. In addition, from the perspective of knowledge running, knowledge innovation capabilities include the capability of knowledge acquisition, knowledge creation, knowledge integration, knowledge sharing and knowledge application. From the perspective of innovative ways, knowledge innovation capability includes the independent innovation capability and cooperative innovation capability. Among these capabilities, independent innovation capability includes the original innovation, integrated innovation and secondary innovation.

(3) Capability of strategic change. The enterprise strategy includes three levels: corporate strategy, business strategy, and functional strategy. Then strategic change capability can be divided into corporate strategic change, business strategy and change the capabilities and functions of strategic change capacity. According to the way of strategic change, strategic change capability can be divided into strategic adjustment and strategic transformation.

By analyzing the multi-layered and multi-angle meanings and dimensions of the high-tech enterprises above, try to build dynamic capabilities of high-tech enterprise system (Table 2).

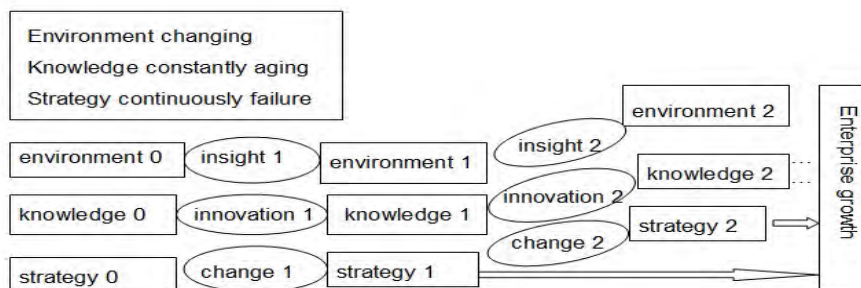
**Table 2 Dynamic Capabilities of High-tech Enterprise System**

Dynamic capabilities of high-tech enterprise	Level indicators	Based on environment / knowledge / strategy	Based on the insight / innovation / change	
	Environmental insight capability	Macro-environmental insight Technical environmental insight Market environmental insight		Advantage insight capability Opportunity insight Disadvantage insight capability Threat insight
Knowledge innovation capability	Technical knowledge innovation capability Management of knowledge innovation capability Institutional knowledge innovation capability		Knowledge acquisition capability Knowledge creation capability Knowledge integration capability Knowledge sharing capability Knowledge application capability	Independent innovation capability Cooperation innovation capability
Strategic change capability	Enterprise strategic change capability Business strategy change capability Functions of strategic change capability		Strategic ability to adjust Strategic transformation capability	

**2.3 Process characteristics of dynamic capabilities of the high-tech enterprises**

The dynamic capabilities have the process characteristics. Dynamic capabilities are nested, which form, enhance and play a role in particular process in order to maintain the dynamic adaptation of the environment - knowledge - strategy, and access to sustainable competitive advantage.

Shown in figure 3, initially the enterprise gets "0" for a balance, which can promote the corporate(Figure 3). Accompanied by the passage of time, the environment changes, knowledge becomes ageing, then existing strategic fails, finally impede enterprise growing. With the dynamic capabilities, the enterprise finds new environment "1", then for knowledge innovation to generate new knowledge to 1 ,changes strategy to form new strategy "1", in order to not only reach new equilibrium "1" state, but also can promote the role of dynamic capabilities. The dynamic capabilities enable enterprises to the dynamic adaptation of the environment, knowledge and strategic in order to achieve sustained growth.



**Figure 3 Dynamic Capabilities Process Characteristics**

### 3 The Mechanism of Dynamic Capabilities of High-tech Enterprises

#### 3.1 Enterprise growth depends on the sustainable competitive advantage

The concept of sustainable competitive advantage is different from competitive advantage. An enterprise can gain competitive advantage, but whether this competitive advantage can last still remains a problem. In the dynamic environmental conditions, competition among enterprises transforms static competition into dynamic competition, that competitive advantage presents the relative and transient. The dynamic capabilities theory still emphasizes the further sustainable competitive advantage. Only to continue to cultivate new competitive edged to get the old competitive advantage can achieve sustained competitive advantage of enterprises and continue to grow.

The continuity is the deserved meaning of enterprise growth. Enterprise growth is subject to the strength of their competitive advantage and sustainability, and if the enterprises want to have sustainable growing they must make the foundation of creating and continuing of their competitive advantage. In short, the enterprises sustainable growing depends on the sustainable competitive advantage.

#### 3.2 Sustainable competitive advantage is rooted in dynamic capabilities

The core competencies aimed at maintaining the status quo, dynamic capabilities designed to change the strain. Core competencies will enable enterprises to gain competitive advantage which but can not be sustained for long. Dynamic capabilities solve the core competencies of rigidity effectively, thus become source of sustainable competitive advantage.

Enterprise growth is an iterative process in long term which the core competence will be went through a complete growth from formation to destruction, and again, as doing the same back and forth to achieve sustained; while it requires dynamic capabilities to complete not only the formation and destruction of the core competencies in the process, but also can transform one core competency into another. Enterprises gain competitive advantage with core competencies in the short term and by virtue of the dynamic capabilities in the long term, several short-term competitive advantages get together to form long-term competitive advantage in order to achieve sustained competitive advantage.

Introduce the concept of core competencies and dynamic capabilities, and then enterprise growth can be a composite function:

$$HG = DC (CC); CC = CC (K, C) \quad (3)$$

Among them, HG: high-tech enterprise growth, DC: dynamic capabilities, CC: core competencies, K: knowledge, C: the basis of capabilities.

#### 3.3 Dynamic capabilities and enterprise growth

Enterprise growth trend is a direct manifestation of their sustainable competitive advantage, and the research of enterprise sustainable growing equals how to build a sustainable competitive advantage. According to the former paper discusses, the propositions and inferences can be drawn as follows.

Proposition A: dynamic capability is a source of sustainable competitive advantage

Proposition B: sustainable competitive advantage is the basis of business growth

Proposition A and Proposition B inference can be:

Proposition C: dynamic capabilities promote enterprise growth through building sustainable competitive advantage.

Based on the above analysis, the dynamic capabilities perspective enterprise growth mechanism can be described as follows. The survival and development of enterprises are based on resources, knowledge and ability which in a certain extent get the organic combination of the formation of core competencies that will take the competitive advantage for enterprises sometime; while in dynamic environmental conditions, the core competencies of rigidity make this competitive advantage disappear after a certain time. With dynamic capabilities, core competencies have dynamic transformation of the upgraded or updated in order to adapt to dynamic environment, and the new core competencies can bring a certain time for the enterprise competitive advantage; then the enterprises can achieve a dynamic competitive advantage in order to achieve sustained growth.

### 4 Theoretical Model of High-tech Enterprise Growth Mechanism under Dynamic Capabilities Perspective

According to the foregoing interpretation, the high-tech enterprises are typical knowledge-based enterprises, and high-tech enterprise growth is essentially continuous innovation and the rapid accumulation of knowledge. Market knowledge and market environment are closely related, strategic management itself is an important part of enterprise management, and these relate the abilities of the knowledge innovation and environmental insight and strategic change more closely.

There are four main ways in enterprise growth: internal growth, M&A growth, network growth and international growth. Dynamic capabilities promote enterprise growth means and gain their own upgrade through these. Internal growth focuses on knowledge creation and internal accumulation (Figure 4), M&A growth focuses on the external (Figure 5), network growth overall consideration internal and external and internal and external accumulation for integration(Figure 6), the growth of international is the inevitable choice to cope with economic globalization, and make full use of domestic and international two markets and the domestic and international two kinds of resources, in line with the essence of dynamic capabilities (Figure 7). Knowledge creation, knowledge acquisition, knowledge integration, knowledge sharing and knowledge application, are inseparable from the organizational learning participation which is the important factor to enhance the dynamic capability to promote knowledge innovation.

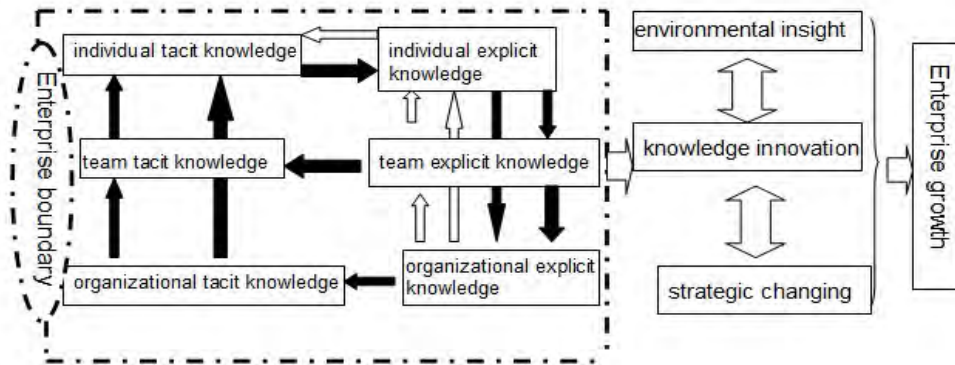


Figure 4 Knowledge Creation, Dynamic Capabilities and Enterprise Growth

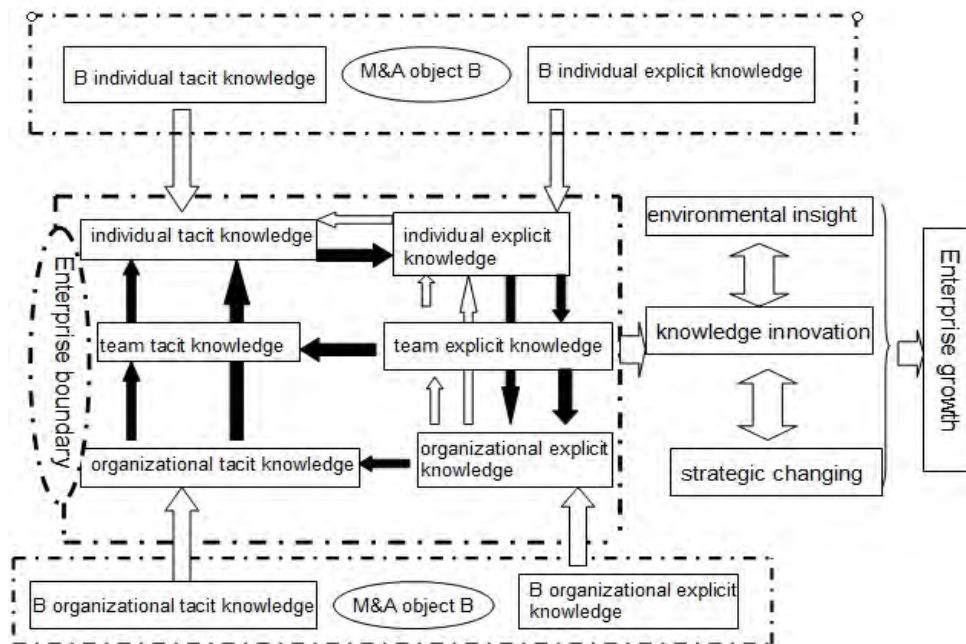


Figure 5 Knowledge of M&A, Dynamic Capabilities and Enterprise Growth



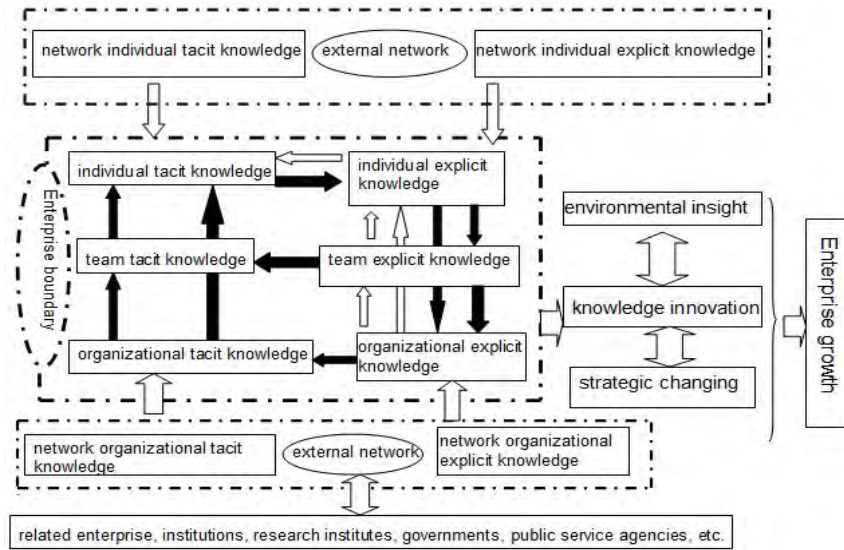


Figure 6 Knowledge Network, Dynamic Capabilities and Enterprise Growth

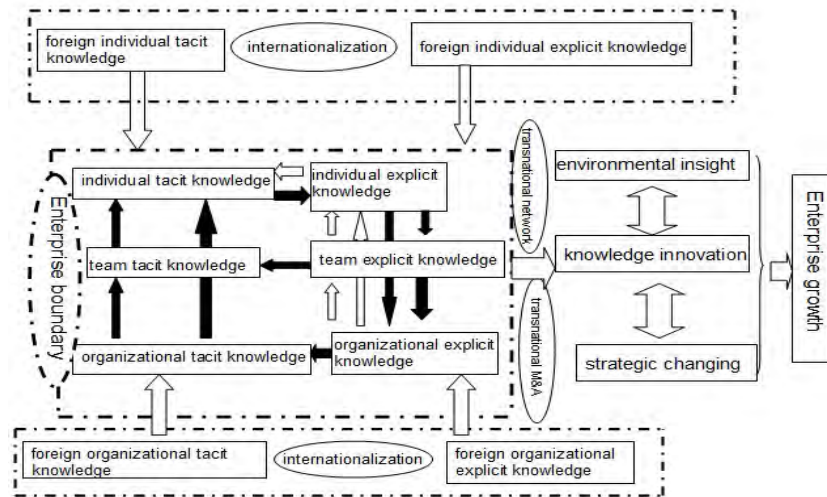


Figure 7 Transnational Knowledge, Dynamic Capabilities and Enterprise Growth

Through the above research, the theoretical model of the high-tech enterprise growth mechanism in the view of dynamic capabilities is in Figure 8.

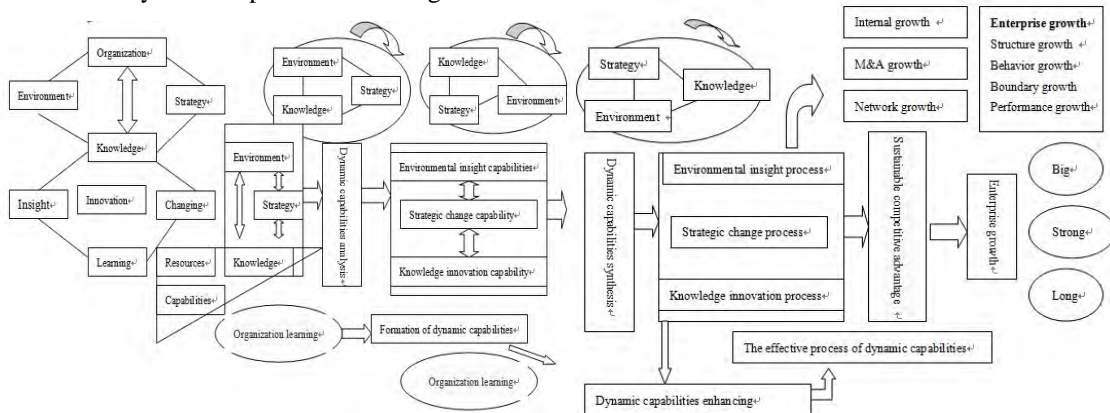


Figure 8 Theoretical Model of High-tech Enterprise Growth Mechanism in the View of Dynamic Capabilities

(1) Enterprise growth should be in the adaptation of the dynamic environment, organization, and strategies. When the environment changes, knowledge and strategic must innovate and change to adapt to the changes; when knowledge innovation have a major breakthrough it must have insight into the opportunities and threats and adjust strategy to profit and avoid loss; when the strategy is adjusted or transformed, it must analyze the conditions with knowledge innovation in order to protect itself.

(2) Enterprise growth depends on the base of the foundation and knowledge. Dynamic capabilities theory emphasizes the integration of internal and external resources, knowledge, and capabilities. The high-tech enterprise growth mainly includes internal growth, M&A growth, network growth, and the international growth is a logical extension of M&A growth and network growth which is in the new era of economic globalization. Accordingly, the enterprise can get full range of multi-level growth in the structure, behavior, boundary and performance.

(3) Dynamic capabilities include environmental insight, knowledge innovation and strategic change. Dynamic capabilities acting on the environment performs the insight capability, acting on the knowledge represents the innovation capability, and acting on the strategy performs transformative capability. Insight and change are the nature of innovation. Dynamic capabilities have an effect on enhancing enterprise growth that in the process of the environmental insight, knowledge innovation and strategic change.

## 5 Conclusion

To the research, the high-tech enterprises is a typical of knowledge-based, learning-oriented, innovative enterprises and growing businesses; dynamic capability is a foundation for high-tech enterprises to gain sustainable competitive advantage, thereby achieving a healthy and rapid sustainable growth; the dynamic capabilities of high-tech enterprises is a complex system concluding environment insight, knowledge innovation and strategic change capacity three components; dynamic capabilities through internal growth, merger and acquisition growth, network growth and international growth play a role and get promoted.

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## What Is Decision Useful Information: A Perspective of Industrial Capital Cycle and Financial Capital Cycle

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**Abstract:** This essay uses qualitative research method to answer the question: what is decision useful financial information. The author believes that financial information is useful only when it suits the decision process of the users. In order to find out what type of financial information fits the users' decision process, the essay analyzes the two capital cycles within firms, namely industrial capital cycle and financial capital cycle. It finds that each capital cycle indicates different risks to the firms. Therefore, for the users, decision useful information should include information that sheds light on the risks underlying the two capital cycle respectively and information that is helpful to compute respectively users' utility on outcomes from industrial capital cycle and financial capital cycle.

**Key words:** Decision useful information; Capital cycle; Objective of financial reporting; Utility function

### 1 Introduction

Since 1970s, the objective of financial reporting is defined as to provide decision useful financial information for existing and potential investors, lenders and other creditors. As this objective is little doubt, accounting standard setters around the world go on to consider what information is decision useful. Their views are summarized in documents named conceptual framework. These views are quite similar and seldom doubt by accounting scholars. Specifically, standard setters believes that, if financial reports meet some qualitative characteristics of financial information, the definitions of elements of financial statements, the criteria of recognition and the requirement of measurement, they successfully provide decision useful information. While agrees the standard setters' opinion on the objective of financial reporting, this essay, however, tries to explain decision useful information from another perspective. The author believes that financial information is useful only when it suits the decision process of the users. In order to find out what type of financial information fits the users' decision process, the essay analyzes the two capital cycles within firms, namely industrial capital cycle and financial capital cycle. It finds that each capital cycle indicates different risks to the firms. Therefore, for the users, decision useful information includes information that sheds light on the risks underlying the two capital cycle respectively and information that is helpful to compute respectively users' utility on outcomes from industrial capital cycle and financial capital cycle.

### 2 Firm's Capital Cycle and Risks

There are two capital cycles within firms. One is industrial capital cycle. The other is financial capital cycle. Firms earn different income from different capital cycle. And they bring different risk sets to firms.

#### 2.1 Industrial capital cycle and the underlying risks

##### 2.1.1 Industrial capital cycle

In nonfinancial firms, the major aim of capital is to earn residual value. The capital that is used by firms to earn residual value is defined in this essay as industrial capital. Residual value is thus named industrial income. Marx (2007) used the following formula to describe how capital was used to earn residual value (industrial income):

$$G—F \begin{matrix} \leftarrow A \\ \leftarrow P_m \end{matrix} \dots p \dots W' —G' \quad (1)$$

G stands for money. G' stands for the increased money. W stands for the volume of commodity. W' stands for the increased volume of commodity. A stands for labor, P<sub>m</sub> stands for production material. P stands for production process. Dotted line stands for the interruption of circulation.

Formula (1) is called industrial capital cycle formula in this essay. It describes the way that firms earn industrial income. There are three phases in the industrial capital cycle: the phase of purchasing production elements (G—W), production phase (...p...) and the phase of selling goods (W'—G'). After the third phase, firms earn industrial income  $x_i$  ( $x_i=G'-G$ ). During the process, capital stays in three

forms respectively, namely monetary capital, production capital and commodity capital. In balance sheet, these three forms of capital are stated as various assets. Specifically speaking, monetary capital is stated as cash on hand and bank deposits. Production capital is stated as raw material, work in process, plant assets and intangible assets. Commodity capital is stated as finished goods.

2.1.2 Industrial capital risks

The goal of industrial capital cycle is to increase the wealth of firms by earning industrial income. During the process, firms have to face several risks that may threaten the goal. These risks are called industrial capital risks. They can be divided into three types: commodity price risk, operation risk and industrial strategy risk. Commodity price risk is the risk that the market prices of production elements and finished goods fluctuate as a result external economic factors. It may change the rate of industrial income and thus affect the profitability of firms. Operation risk refers to the risk that commodity capital may not be able to be converted into monetary capital smoothly, as a result of implicit factors such as the incapability of controlling production cost, defects in product quality, and ineffective product promotion. Industrial strategy risk is a risk that overrides the whole industrial capital cycle. It refers to the risk that the industrial strategy adopted may not be able to bring in maximized industrial income. This risk arises from both implicit factors and explicit factors, such as the change of macroeconomic environment and technology innovation.

Industrial capital risks bring uncertainty to the firms while they are trying to maximize their wealth through earning industrial income. If these risks are effectively managed, the firms' goal is most likely assured. On the contrary, profitability of the firms will suffer. Firms may even incur losses as a result. In the extreme situation,  $G'$  in formula (1) may reduce to zero, i.e.,  $G' \geq 0$ . In this case, the maximum loss firms incur will be  $G$  ( $x_i = G' - G = 0 - G = -G$ ).

2.2 Financial capital cycle and the underlying risks

2.2.1 Financial capital cycle

In modern nonfinancial firms, there exists a second capital cycle. This is called financial capital cycle in the essay. Financial capital comes from two sources: idle monetary capital that regularly arises from industrial capital cycle and receivables. It is defined as the type of capital that firms try to earn financial income by taking advantage of the value change of opportunity capital.

During the industrial capital cycle, some monetary capital remains idle. With the goal to maximize the wealth of firms, firms use the idle capital to earn a type of income other than industrial income, which is called financial income in this essay. For example, firms may deposit the idle money into a bank to earn interest income or use the idle money to buy financial products, such as stocks, bonds and derivatives, to earn investment income. The formula that describes how firms earn financial income through idle capital is as follows:

$$G-F < \begin{matrix} P \\ O \dots e \dots F' \end{matrix} - G' \tag{2}$$

$G$  stands for money.  $G'$  stands for the increased money.  $F$  stands for the amount of financial product.  $F'$  stands for a changed amount of financial product.  $P$  stands for principal capital.  $O$  stands for opportunity capital.  $E$  stands for explicit financial factors. Dotted line stands for the interruption of circulation.

Formula (2) is called Financial Capital Cycle Formula I (FCCF I). According to this formula, financial capital cycle consists of three phases. In the first phase, idle monetary capital is converted into financial capital ( $G-F$ ). The financial capital is understood to consist of two parts: principal capital and opportunity capital. In the second phase, financial capital is exposed to external financial factor ( $\dots e \dots$ ). During this phase, the value of financial capital  $F$  is changed randomly. And At the end of this phase,  $F$  becomes  $F'$ . At the end of the third phase, financial capital  $F'$  is converted into monetary capital, and firms realize financial income  $x^F = G' - G$ .

Take time deposit as an example to explain these three phases. In the first phase, idle money  $G$  is converted into time deposit  $F$ . On the date of the transaction,  $G$  is equal to  $F$ . Another fact on this date is that the value of time deposit ( $F$ ) can be divided into two parts: the value of principal ( $P$ ), which is equal to  $G$ , and the value of opportunity ( $O$ ), which is equal to 0. This fact can be expressed as:  $F = P + O = G + 0 = G$ . An important characteristic of financial capital cycle is that, in the first phase of the cycle, firms buy a commodity named opportunity at a initial cost of zero by surrendering the use right of money capital (i.e., principal). Opportunity, as a commodity, is understood as a chance for firms to gain a different amount of money capital  $F'$  after the second phase of the cycle. In the case of time deposit, the chance comes from the time value of money and the changing credit of the bank. The value of the

principal is supposed to be constant at  $G$  during the second phase, because, without buying the opportunity, the idle money will remain at  $G$ . However, during the second phase, the value of the opportunity capital will fluctuate as it's exposed to external financial factors, such as the change of credit risk of the banks and market interest rates. When the firms realize financial income in the third phase, the entire financial income is contributed by opportunity capital.

The second source of financial capital is receivables. Recall the third phase of industrial capital cycle. In that phase, goods are sold and industrial income is earned. However, firms do not always get  $G'$  to end this phase. To increase their competitiveness, firms sometimes get receivables instead of cash to end this phase. Receivables, before they are converted into money capital, are considered as financial capital. They meet the definition of financial capital. When firms accept receivables instead of cash in the sale of goods, they are buying an opportunity from the customers. The value of the opportunity capital depends on the credit of the customers. Thus, we have a second financial capital cycle formula:

$$M' - F < \begin{matrix} P \\ O \end{matrix} \dots e \dots F' - G' \quad (3)$$

Formula (3) will be called Financial Capital Cycle Formula II (FCCF II). The only difference between FCCF I and FCCF II lies in the first phase of the cycle.  $M'$  stands for merchandise capital. In FCCF II, when goods are sold, they are not converted into monetary capital. Instead, they are converted into financial capital, receivables, which can be divided into two parts: principal capital, which represents the sales revenue, and opportunity capital, whose value fluctuates with the credit risk of the customers.

In the balance sheet, financial capital is reported as assets, such as loan and receivables, financial assets held for sale, financial assets available for sale, financial assets held to maturity, and investment property.

### 2.2.2 Financial capital cycle risks

The risks that firms face during the financial capital cycle are called financial capital cycle risks. These risks can be divided into two groups: financial risk and financial strategy risk. Financial risk refers to the unfavorable external financial factors that may threaten the value of opportunity capital. Jorion (2007) further classifies financial risk into five groups: market risk, credit risk, liquidity risk, operational risk and legal risk. Financial strategy risk refers to the risk that the management's strategy on financial capital allocation and financial capital risk management may not be helpful for the firms to earn financial risk. As the value of opportunity capital is mainly affected by external financial factors, financial income can only be earned by luck or by effective financial strategy. Thus, how well financial strategy risk is managed determines how well the firms' goal is achieved.

## 3 The Effect of Firm's Capital Cycle on the Objective of Financial Reporting

The objective of financial reporting is to provide decision useful financial information to the users of financial reports. Observe the decision making process of these users and we will gain some insights on what are useful information. Since equity investor is usually considered as a typical and important user group, our observation will lay on their decision making.

Equity investors' decisions include buying, holding or selling the stocks of firms. According to decision theory, equity investors follow some logical steps to make decisions. First, they will discern all the uncertainties facing them. These uncertainties are called natural states. Let  $S$  represent the state set.  $S = \{s_1, s_2, \dots, s_n\}$ . Since the risks underlying industrial capital cycle and financial capital cycle are different,  $S$  will consist of two subsets  $S^I$  and  $S^F$ .  $S^I$  consists of the natural states from industrial capital cycle and  $S^F$  consists of the natural states from financial capital cycle.  $S = S^I \cup S^F$ ,  $S^I \cap S^F = \emptyset$ . Second, they will compute the expected utility of each action. Let  $A$  represent the action set.  $A = \{a_1, a_2, \dots, a_k\}$ . Each  $a$  ( $a \in A$ ) stands for a specific action. Let  $X$  represents outcome set.  $X = \{x_1, x_2, \dots, x_j\}$ . Each  $x$  stands for an outcome from the combination of some  $s^I$ ,  $s^F$  and  $a$ . Assume that the outcome from industrial capital cycle and financial capital cycle can be separated. Then  $X = X^I + X^F$ . Expressed with function,  $x^I = G(s^I, a)$ ,  $x^F = H(s^F, a)$ . Third, they will apply a subjective probability to each natural state and then choose the action with the maximum utility. Let  $p_i^I$  ( $i=1, \dots, g$ ) represents the subjective probability applied to state  $s^I$ .  $p_j^F$  ( $j=1, \dots, m$ ) represents the subjective probability applied to state  $s^F$ . Function  $F(a)$  represents the utility function of equity investor. If he is someone with economic rationality, his action can be expressed as follows:

$$\begin{aligned}
& \max F(a), (a \in A) & (4) \\
F(a) &= \sum_{s^I \in S^I} U(x^I) p(s^I) + \sum_{s^F \in S^F} V(x^F) p(s^F) \\
&= \sum_{s^I \in S^I} U(G(s^I, a)) p(s^I) + \sum_{s^F \in S^F} V(H(s^F, a)) p(s^F) \\
&= E[U|a] + E[V|a] & (5)
\end{aligned}$$

Formula (5) gives us some insights on what information is supposed to be decision useful information. First, as equity investor knows that the risks underlying industrial capital cycle and financial capital cycle are different, they tend to compute outcome  $x^I$  and  $x^F$  separately. This means that they need information that helps them to evaluate the value of assets attributable to industrial capital cycle and assets attributable to financial capital cycle. Specifically speaking, they need information that enable them to discern  $s^I \in S^I$  or  $s^F \in S^F$ .

Second, though we assume that the form of utility function used by equity investor is fixed, the forms of utility function used to compute the utility from industrial capital cycle and financial capital cycle are different. Function  $V(x^F)$  is usually more risk averse than function  $G(x^I)$ . One reason is that the variance of  $x^F$  is far larger than  $x^I$ . The other reason is that  $x^F$  will not recur typically while  $x^I$  has a higher persistence. Since equity investor has experienced several financial crises in recent years, it is expected that function  $V(x^F)$  is more sensitive to unfavorable outcome than favorable outcome. The difference between the form of  $G(x^I)$  and  $V(x^F)$  means that equity investor's information need in computing outcome from industrial capital cycle and financial capital cycle is not symmetrical. The high risk characteristic of financial capital cycle forces them to require more risk information, so that they can reach a more accurate computation of utility.

#### 4 Conclusions

What is decision useful information? This essay tries to answer the question by analyzing the two capital cycles, namely industrial capital cycle and financial capital cycle, within firms and the risks underlying these two cycles. It concludes that decision useful information should include information that sheds lights on the risks underlying the two capital cycle respectively and information that is helpful to compute users' utility on industrial capital cycle and financial capital cycle respectively. The contribution of this essay is that it combines the understanding of capital cycle and information users' decision making process to discern what information is considered decision useful. This method is different from that taken by standard setters, who consider that decision useful information is information that meets certain qualitative criteria. Since the understanding of decision useful information is so important for the achievement of objective of financial reporting, more methods should be explored to shed light on it.

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# Communication Characteristics of the Meanings of Advertising Works in the New Media Age

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**Abstract:** In light of semiology and communication theories, the paper analyzes the communication characteristics of meanings of advertising works under the new media situation, and attempts to put forward an analysis model for the meanings of advertising works. The meanings of an advertising work tend to be more complicated and polysemous in the creative phase especially when the multimedia display has become more frequently-used currently. In the decoding stage, the meanings of an advertising work tend to be unlimited according to the selectivity principle of understanding, because the communication based on new media has special characteristics such as personality and interaction which highlight the power of the audiences' interpretations of advertisements. It is found that there are only six factors as the focuses of the meaning polymerization in the whole advertising communication process, and the dominant role in the dynamic variation of six factors determines the final effect of communication.

**Key words:** Meanings of an advertising work; Communication characteristics; Complication and polysemia; Meanings communication process; Factor; Communication and semiology theories

## 1 Introduction

Under the environment of new media, advertisement is almost seen everywhere and has drawn a wide attention. It is not only a marketing tool but also a social actor and a cultural artifact along with the more and more pervasive impact of new media on society. Advertising activity is a kind of meaning communication about the ad works, so it is necessary to study on the communication characteristics of the meaning of ad works. It is beneficial to be more objective and accurate for predicting advertising effect and its social influence, and lead the advertisement culture to develop in a sound way.

Researches on the meanings and communication characteristics of advertising works started in 1950s and 1960s. Some famous scholars made pioneering studies, such as Roland Barthes, who made his studies from semiotic perspective; James M. Vicary and Wilson Bryan Key who did from a psychological perspective; and Frankfurt School from the perspective of the social critical theory. In China, lots of related research papers have been published since the 1990s. These researches disclosed the complexity of the meanings of ad works from different angles. However, up to date, there is not an effective meaning analysis model of ad works which has been generally accepted. With the appearance of new media age, the meaning communication of advertisement shows some new characteristics. What are the new characteristics? An effective meaning analytical method is based on a better understanding of the characteristics. So this article attempts to analyze and probe into this question. It mainly focuses on three aspects: signifying characteristics, decoding characteristics, and the dynamic variation characteristic of the meanings of ad works in communication process, to aim at more effective analytical method of advertisement.

## 2 Evolving Tendency of the Meanings of Ad Works in the New Media Age

### 2.1 Advertising creativity makes an ad work complicated and polysemous

The purpose of commercial advertising is to disseminate sales promotional information, but the implications of ad works loading promotional information are complicated. The primary reason is that creative strategies make ad works polysemous. It is a common phenomenon for advertising-minded people to put product information into some new meanings. Like Leo Burnett, the advertising master stated, "Good advertising does not just circulate information. It penetrates the public mind with desires and belief."(Leo Burnett, 1960s). In addition, as far as the creativity aim is concerned, ad works should firstly attract the attention and interest of the audience, and then spread commodity information to arouse their purchasing desire. Under the modern media background, novel advertising creativity is one of the important ways to capture markets in the increasingly fierce competition. The famous AIDMA theory also indicates that advertising should be attractive, interesting and memorable (E.S.Lewis, 1898). Otherwise, the advertising message will just pass unnoticed without leaving anything in the mind of the

audience. In order to attract a variety of audiences, the advertising information should be endowed with rich implication. Therefore, advertising creativity would make an ad work polysemous by a variety of rhetorical means rather than simply show advertising information. For example, “Start ahead” (Rejoice shampoo) uses the homophonic pun and makes intentional ambiguity; “Come to where the flavor is. Marlboro Country” attempts to evoke rich associative meanings.

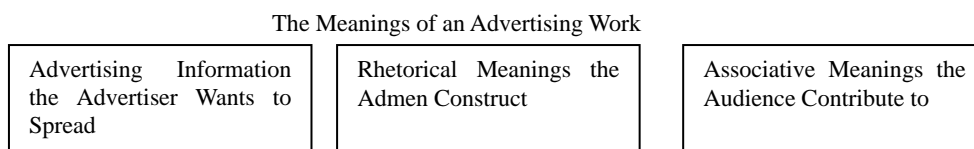
**2.2 Nonverbal symbols of multimedia make advertising meanings uncertain**

The secondary reason of ad content complexity is that, in new media environment, multimedia has become a familiar means of ad presentation. The expression and transmission of advertising information are realized by symbolized means such as language and image building. Symbols or codes consist of two types: verbal and non-verbal ones. The multimedia advertising works use more nonverbal symbols such as picture, voice, animation, etc. The English scholar Michael Argyle considers that verbal codes are normally used for communicating conscious information, whereas non-verbal codes usually reflect unconscious implication and express attitudes and emotions (Michael Argyle, 1972). Accordingly, meanings of nonverbal symbols are of uncertainty and fuzziness. So the explanation to nonverbal symbols is intuitional and easily influenced by the receiver’s experience, emotion and mood. Though verbal symbols can give specific meanings explicitly, the clarity may be relative in multimedia presentation. In the complex context, it is likely that there are many kinds of different interpretations of the same discourse. And, as Cadamer said, the significations of the text do not sometimes but always transcend the intentions of the speakers (Hans-Georg Gadamer, 1960).

**3 The Highlighted Power of the Audience’s Interpretation of Advertisement**

**3.1 The meaning system of advertising works**

The meanings of an advertising work are all significations of symbols, including the meanings that the advertiser and admen want to communicate and the accepters comprehend, are referred to as advertising information, rhetorical meanings and associative meanings respectively in this paper. (Because the audience’ perception is selective, this paper calls it associative meaning. the following text will discuss this.) Figure 1 shows the meaning system of advertising works.



**Figure 1 The Meanings of an Advertising Work**

**3.2 Interaction and real-time sharing highlight the power of the audience’s interpretation of advertisement**

Nowadays, the audience’s interpretation is more striking. Interaction and real-time sharing represent the main difference between traditional media and advanced ones. The report from CNNIC shows that the number of netizen in China has exceeded 500 million in 2011 and is still increasing. The internet penetration rate stepped up to 38.3% compared with those at the end of last year, increased by 4% (CNNIC, 2012.1). Interactive social network sites have a great impact on people’s lifestyle. With the popularization of blog, qq, microblog, videosharing, etc., people are more convenient to air their opinions openly. The audience can express their opinions and evaluations on advertising immediately. So the power of the audience’s interpretation of advertisement is highlighted. In such case, it becomes more important to research on the law of audience decoding ad works.

Selectivity is a basic characteristic in audience decoding activity according to the communication theory. It includes selective perception, selective exposure and selective retention. The law also discloses psychologic characteristics of audience of ad works. The advertisers and admen always preset a certain theme into an advertising work, but the audience is distractible appreciators. Due to their selective notice, perception, and memory, their explanations are subjective, random and rich in associations. It indicates that the audience can recreate new meanings for an ad work. As to the advertising signal, they can omit it, distort it, or choose what they are fond of by the individual wills. Namely, the comprehension of audience may not be restricted by the presupposition theme. In creative process of an ad work, if admen cannot comprehend their work in view of consumers, they may bring about some troubles. For instance, China banned a Nike TV commercial titled “Chamber of Fear”, because the ad showed the celebrity LeBron James battling a cartoon Kung Fu master and a pair of

dragons, considered as a sacred symbol in traditional Chinese culture. The ad had received an indignant response from Chinese viewers, and Nike Inc. later apologized for the advertisement (China Daily, 2004).

**3.3 The meanings that audiences follow**

What are the meanings that the audiences follow? The polysemy and uncertainty of symbols provide an extensive space for people’s comprehension. “The same text may have different meanings for different persons, and for the same person at different times.”(Jaap van Brakel, 1995). The perception based on the symbols in ad works comprises three kinds of associative meaning. The first is associative meanings aroused by a single sign, for example, “red” may be interpreted as “passion”, “blood” or something else related to individual feeling. The second is co-occurrence associative meanings caused by some combined symbols, the audience can combine the symbols or meanings at random. For example, on a simultaneous celebrity and brand TV show, the audience maybe like the brand because of adoring the celebrity, or hate the celebrity because of disgusted brand experience. The third is the integral associative meanings based on the unity of the ad work.

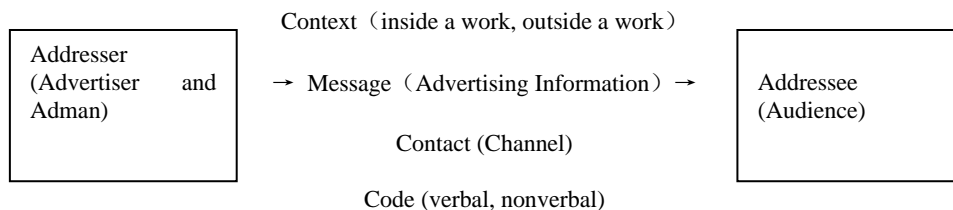
In addition, comprehension is affected by many factors such as culture, view, status, attitude, emotion, mood, need and even unconsciousness. The meanings assigned to the advertisement may be relate to any aspect such as product, feeling, view, society, culture, form and style, etc. Thus the associative meanings of an advertising work probably consist of an unlimited set of meaning items.

According to the previous analysis, the new media environment is more likely to lead to the meaning set of an ad work unlimited expansion. Linguists have tried to establish componential analysis theory, but there is not an effective meaning analysis model of ad works which has been generally approved of. Though it is difficult to know all meanings, we can try to hold the communication process by studying the characteristics of meaning communication.

**4 The Meaning Communication Process and Dynamic Variation of Advertisement**

**4.1 The meaning communication process of advertising**

R.Jakobson, the famous semiotician, put forward that any communication process is composed of six factors: the addresser and the addressee; the message; the code; the context; the contact ( R.Jakobson, 1960). The model is applicable for advertisement analysis. The meaning communication process of advertisement can be described as follows (Figure 2):



**Figure 2 The Meaning Communication Process of an Advertising Work**

The communication process starts because the advertiser intends to spread the ad information, and the end is addressee (namely, audience, consumers). Information communication needs the contact between addresser and addressee. The contact is realized through different media channels, and it must appeal to codes. Context is the most complicated factor, having powerful impact on meaning communication. An ad work faces double contexts: one inside the work and another outside the work. The former is composed of discourse, story, picture, action, etc. which are designed in the ad work. The latter (context outside the work) includes time, place, occasion of communication, and participants’ occupation, ideology, education, mentality, etc. Context exerts a great influence on interpretations of works.

Because every code system has some uncertain and fuzzy elements, there is always a considerable number of meanings that the audience comprehends by context, code and channel feature. For example, the brand “Kong Fu Jia Jiu liquor” naturally arouses the association of Chinese culture; a lot of people think ads on CCTV credible because they believe the medium.

**4.2 The dynamic variation of advertising meanings in the communication process**

Although interpretations differ in thousands of ways, these meanings are usually oriented toward one of the six factors. So each factor of them is a focus of the meaning polymerization. There is a

function of communication corresponding to each of them. But they are unbalanced in a communication process. One can be predominant, holding the communication process, and leading the audience inclination. When addresser is predominant, the meanings of establishing image for the advertiser and sales promotion are outstanding. The referential meaning is oriented toward the context (e.g. the meaning as “who is the actor of the ad?”). When the communication emphasizes the contact, medium may draw the audience attention. For example, somebody may believe a TV ad because he trusts in TV. When code is the predominant factor, the dominant meanings may like “What is the style of the ad work?” and “Is the picture beautiful?”, and so on. If the communication is oriented toward message, commodity information is the most attractive.

#### 4.3 Ways to seek the dominant meanings

(1) The analysis of core meaning items based on the six factors. The theory of six-factor model provides an effective method that simplifies the analysis process. Even in the environment of new media, the communication process is still composed of the six factors. The meaning analysis model based on six factors pays attention to the meaning polymerizing focuses and semantic orienting directions rather than all meaning items. The core meaning items are the items that represent the semantic orientation and lead the audience inclination. So we can set about analyzing the features of six factors in an ad communication process, and then find the typical and representative meaning items around each factor. Modern interactive networks and social networking sites provide a platform for finding core meaning items. Leech classified meanings into seven kinds: conceptual meaning, connotative meaning, social meaning, affective meaning, reflected meaning, collocative meaning and thematic meaning (Leech, 1974). The reasonable classification also offers reference for a strict analysis. Based on this analysis, maybe we can find some clues that control the communication process.

(2) Investigation. When a single theoretical analysis cannot solve all problems, investigation is essential. What is the most attractive factor to the audiences? A survey released in 2007 (by the School of Journalism & Information Communication at Huazhong University of Science & Technology) showed that about 35 percent of people thought it is picture and music in an ad work, about 30 percent thought it is advertising information, and nearly 15 percent thought it is story or brand. But a correct conclusion is determined by different situation at that time. Constant investigation and research are the scientific method of market prediction. Today sharing and opening networks facilitate consumer investigation greatly.

## 5 Conclusion

To sum up, this paper discusses the meaning communication characteristics of advertisements in signifying and decoding stage under the new media situation, and presents the dynamic variation characteristics of six factors in the communication process. An advertising communication process is composed of six factors: the addresser and the addressee; the message; the code; the context and the contact. In view of the uncertainty and complication of ad meanings and the unlimited probabilities the audience comprehends, this article finally puts forward a core meaning items analysis model based on six-factor model. The model simplifies the meaning analysis process and is more likely to find the dominant factor and meanings that lead the communication process. Of course, besides a scientific theoretical analytical method of advertisements, investigation and research are essential and effective ways of market prediction.

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# Core Competencies And The Strategic Management of R&D

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**Abstract:** This paper expounds the theoretical paradigm of the importance of core competitiveness. Points out the advantages of core competence model pointed out that links and strategic management one, mutual trust and salary incentive system, in order to reveal the effects of the research and development. First of all, we know the important of the research and development. we focus on the view of the communist party of China. And then we do detailed research on the core competitiveness of the potential of the most important factors in the description, and give the empirical analysis to support this view. Finally, we can draw the conclusion is that research and development manager and their clients directly within the company between common co-sponsor more and more attention, we can be in continuous research, the case study company.

**Key words:** Core competence paradigm; Strategic management; Research and development; Organizational structure; Multiple linear regression model

## 1 Introduction

Large enterprise strategic management of research and development (R&D) is very important to the core competitiveness of the example (CPC). The communist party of China and emerging between R&D of literature of strategic management a crucial issue has a primary instrument panel similar. The problem isn't as an independent strategic business units (SBUs) of the set, but as a SBU use some common enterprise resources of the concept of diversified company set. Think of the communist party of China, the enterprise can find out the core competitive power, it is the company's unique professional knowledge accumulation, learn from the previous investment. These ability is seen as long-lived assets over specific product market business unit by using these skills. The following mandatory meaning is core competitiveness, becoming the fulcrum of the strategic decision, and excessive dispersed, control SBUS may endanger their sustainable development and value. Nowadays some other methods can also promote the communist party such as mutual trust and salary incentive system, we can use specific data to prove this view.

## 2 The Core Competence Paradigm

Core competence can be thought as consisting of bodies of technological expertise (both product and process) and the organizational capacity to deploy that expertise effectively. Thus they are not simply technological in character, they are also organizational. They are embellished and strengthened through continued using (in other words they are subject to positive returns), and therefore to some extent firm-specific and non-transferable. Indeed, the definition of CCs, given by Prahalad and Hamel insists that not only must they give access to multiple markets, and confer specific advantages to customers, but they also must be difficult to imitate.

CCs are not monolithic. They have an internal structure which is composed of a number of capabilities. The organizational dimension of a core competence appears to lie in part in the ability to combine appropriate capabilities into specific competencies.

Competencies are given a physical and commercial reality in core products, which have a market leading performance in a specific area of the customer's functionality requirements. The often quoted examples here are Canon's laser-printer engines, and Honda's high revving, smoothly performing internal combustion engines. Core products are then deployed in a variety of end-products.

The principle of a variety of technologies (capabilities), being combined in many permutations to create a variety of end-products is not in itself new. The specific feature of the CC paradigm seems to be the emphasis on the intervening concepts of CCs and core products. These are, in essence, particular combinations of capabilities, which are robust over time, confer specific advantages to the supplier and the customer, and therefore create a preferred and firm-specific migration path from technological knowledge to end products for the firm in question. Once this is recognized by a firm, it is then argued that they can use their CCs as an 'orientation device' to shape strategic choices about acquisition of new technologies and development of new end products. Basically, if a technology strengthens your CCs you should acquire it, and if a product exploits your CCs, you should make it. This method seems to create a

need within the company for intelligence and forecasts concerning technical trends and market trends, in order to 'steer' the evolution of the CCs.

Some of the practical implications of this perspective are defined by contrasting the CC paradigm with an outlook based on seeing a corporation as a collection of more or less autonomous SBUs. It is pointed out that a business run as a portfolio of SBUs is in danger of dissipating CCs, or even of inadvertently outsourcing them. CCs can get 'imprisoned' within one SBU and not be made available to other SBUs. The people who are the embodiment of the CCs can be insufficiently mobile with respect to the SBUs. It is clear then, that in the context of large multiproduct firms, the concept of CC is designed to act as a representation of the overlaps and synergies between products. These overlaps and synergies are what make the diversification pattern of the firm rational rather than random, and in addition, they make the firm capable of specific differentiations of its products which confer competitive advantage. Without the use of CCs, a firm's products are less likely to be competitive and less likely to add new cumulative skills to the firms' armory.

### **3 The Link Between Core Competencies and Strategic Management of R&D**

If we now attempting to integrate the two discussed the concept and language, we found some preliminary simple results:

(1) it is one of the duties of R&D acquisitions, produce technical ability, this is the core competitiveness of the important cornerstone.

(2) many of these function is about other business, and research and development manager is often the "default" department manager, technical benefit protection a position of responsibility, appropriation system make it difficult to the operation of the department for cooperation.

(3) in the innovation of the specific application of the project research technical ability, the production of new products and technology, function dependent on complex coordination process, it also involving marketing and operation function. These coordination process, which spans the entire division, and often beyond the other parts of the company's division, is in fact the dimensions of the core competitiveness of the organization is an important part. These coordination process, have a firm specific character lead to the market and technology constraints of the specific experience accumulation.

Therefore, the research and development of the company is the function of the core competitive power web site, but it has two main joint or with the core competitive power point of contact. The first joint investment mode is: in one of the R&D and R&D activities related to the management and development of the technical ability of the combination, in such a way that it directly into the company's core competitiveness of the feed. Therefore, this can't do enough, unless these core competitiveness has been set. The second cohesion is harvest mode, with the orientation of market development of core competitiveness, produce specific cultural relic, or provide for the customer service function and other divisions of functional participation.

The core competitiveness of the potential of the most important factors in is: organization structure, dynamic economies of scale and market knowledge.

The structure of the organization: and this related structure, especially those innovation and product development in the process of connecting various function contributor. These are the level of the SBU between technical personnel, marketing function, operation function of contact. Because the other business related to the core competitive ability, part or all of these functions will allow the skills and knowledge, to the dept of migration between, or division of the organization is Shared between function.

Dynamic economies of scale ability, must continue to shrink, so that they don't exercise. Develop a products in the fields of competitiveness to create new knowledge, expand and deepen ability, make it in other areas of the future of the precious mining. Ability, so be through the perfect and polishing are using, and increase the value of the company.

Market knowledge: a broad definition from all fields for market (which may include suppliers and customers market), this is necessary to make core competitive ability constantly to be translated into core product knowledge.

### **4 The Behavior of Mutual Trust Between the Employees and Managers**

Part of the behavior of mutual trust between the employees and managers can promote the company's core ability, including management activities, signal hint can give employees bring greater incentive mechanism, improve work enthusiasm, jointly promote the company's every level of the development. WILLIMS (2007) had stressed that in both sides of the interaction, trust the grasp of the

party trust mechanism produces social mechanism, and some behavior strategy for his party's reputation can be emotional and cognitive behavioral effects, and the conclusion that, so the mood has established more active. Therefore, if the enthusiasm of management as a trusted party. This is no doubt can get the party's trust effective response. To further discuss research, we might as well do two related hypothesis: suppose a employee behavior and loyal employees are related cognitive trust regulation. Assumption 2: employee behavior and loyal employees are related, in the research process of the emotional trust supervision, we take the way of questionnaire survey, involving the electric power industry, chemical industry, real estate, tourism, etc, altogether collected to the sample of the more than 500 valid questionnaires, SPSS, linear structure, high level statistical software processing, display, employee behavior and management staff credible cognitive trust and emotional trust relationship model fitting is better, RMSEA = 0.061, SRMR = 0.047, fitting index CFI = 0.9, international financial institutions = 0.90, NNFI = 0.89, visible, assuming that get the support of the data.

Model:

Employee trust regulatory role cognition:

$$L1: CT_j = \beta_{0j} + r_{ij}; L2: \gamma_{00} + u_{0j}$$

$$L1: CT_j = \beta_{0j} + \beta_{1j}(IT_j) + \beta_{2j}(EC_j) + \beta_{3j}(DS_j) + \beta_{4j}(LY_j) + r_{ij}$$

$$L2: \beta_{0j} = \gamma_{00} + \gamma_{01}(FO) + u_{0j}; B_{1j} = \gamma_{10} + \gamma_{11}(FO) + u_{1j};$$

$$B_{2j} = \gamma_{20} + \gamma_{21}(FO) + u_{2j}; B_{3j} = \gamma_{30} + \gamma_{31}(FO) + u_{3j}; B_{4j} = \gamma_{40} + \gamma_{41}(FO) + u_{4j}$$

Staff emotional adjustment role trust:

$$L1: AT_j = \beta_{0j} + r_{ij}; L2: \beta_{0j} = \gamma_{00} + u_{0j}$$

$$L1: CT_j = \beta_{0j} + \beta_{1j}(EC_j) + \beta_{2j}(DS_j) + \beta_{3j}(LY_j) + r_{ij}$$

$$L2: \beta_{0j} = \gamma_{00} + \gamma_{01}(FO) + u_{0j}; B_{1j} = \gamma_{10} + \gamma_{11}(FO) + u_{1j}; B_{2j} = \gamma_{20} + \gamma_{21}(FO) + u_{2j}; B_{3j} = \gamma_{30} + \gamma_{31}(FO) + u_{3j}$$

Note: L1 = first layer model; L2 = the second model, CT = cognitive trust; IT = upright; EC = attribute for under; DS = cautious behavior; LY = loyal behavior; FO = system control; CM = organization atmosphere.

## 5 The Salary Incentive System To Promote CCP

In addition, still have a plenty of a strategy of the salary reward mechanism of the core competitive power. Salary incentive system exists in the from all walks of life position. Ordinary employees need to be paid for the incentive, company executives also need high return of pay. This is usually in some monopoly industries, in recent years, particularly outstanding. Employee wages have been going up, this phenomenon results from increase control executives employee welfare brings high wages can make senior management pay more attention to the control. It is, after all, high control, to improve the company's core competitiveness positive effect, we may as well test it again with the empirical analysis.

Hypothesis: executive compensation, executives and control were positively correlated. We choose as test samples and range from 14 home typical industry, including banking, insurance, such as manufacturing, some of the listed company, we get from CSMAR and the company's annual report data. The final agreement with the help of SPSS, the data, it is not difficult to find: with this year's growth, executive pay a significant increase, the staff increased to 1 was significantly lower than the management personnel, including the financial industry, or in the first. And in recent years the core competitiveness of the financial industry increased many indeed. So we can think, higher salary incentive mechanism, and improve the core competitiveness of the enterprise.

## 6 Conclusion

This paper thinks, a research and development manager and their clients directly within the company between common co-sponsor more attention to and have reliable mechanism, and also to the research and development of effective directly rapid innovation and long-term technical strength accumulation. This led to research and development manager seeking analysis tools to help them identify technology has the competitive advantage of multiple division, special meaning, and for long term strategic orientation, but located close to their enterprise the core of strategy. The core competitiveness of the enterprise strategy as a new model of the idea that the review parallel literature, ability can be a useful key equipment, to help create the linkage between the technology of enterprise strategy and non-technical agenda. In order to develop this idea, now need further study on the specific company specific core competitive ability, the ability and the research of the units of the connection between the strategy. Fully do this the detailed analysis of the level is such, long-term case studies, is likely to be the best approach. The work itself is hung in the case study of the technology development

strategy, the actual practice.

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## Research on College Students' Spiritual Life under the Network Information Technology\*

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**Abstract:** This paper puts the reality that the influence and innovation of the development situation of science and technology on people's spiritual life as the logical starting points. On the basis of stating the basic implications of the network information technology, the author gives an analysis of college students' spiritual life under the network information technology. The conclusion that the internet is the new space of college students' spiritual life, the network information technology innovates college students' spiritual life style and is likely to dispel the meaning of their spiritual life simultaneously is obtained.

**Key words:** Network information technology; College student; Spiritual life

### 1 Introduction

Since the 1940s and 1950s, with invention and applying of electronic computer, space technology and biology technology as major characteristics, human have launched an information controlling technology revolution which touched information technology, new energy technology, new material technology, biology technology, space technology, marine technology and many other fields. And this is the third giant leap in technology after the steam technology revolution and electrical technology revolution. This revolution of science and technology leads people's social life and its modernization toward a higher development level. It not only promotes the development of human society, economy, politics and culture greatly, but also impacts people's life styles and thinking modes deeply.

"IF we regard plough and millstone as the characteristics in agriculture times and steam engine and motor as the characteristics in industrial age, computer and network must be the characteristics in information era."<sup>[1]</sup> In 1969, the ARPANET was born in the United States Department of Defense. After that, the internet spread its feelers into all fields in people's life. Particularly, since human stepped into 21 century, the internet has influenced people's life in various aspects with its unprecedented spread speed, irradiation space, interactive mode and rich intension. The network information technology is the typical one of science in modern times. The network information technology turns the internet into an organic whole by gathering and integrating its resources, and realizes the goal that its resources can be shared completely and worked together, and let people use its resources transparently and acquire whatever you need. The biggest development tendency of the network information technology is multi dimensional. That is offer a kind of information integration service to the user on one system, including many resources come from politics, economy, culture and other fields. It even also can supply multi-media information simultaneously, such as pictures, audios, videos and so on. With the development tendency of multi-dimensional of the network information technology, information sharing, network chatting, electronic mail, internet trading, video playing and many other new forms of network application emerge constantly, which enlarges and expands people's sense organ, nerve system and brain function. On the basis of the charm of its unique virtual, global, open, interactivity and real-time, network information technology not only promotes the development of economy, political and culture of human society greatly, brings people a completely new world, but also changes our mind and philosophy of life simultaneously.

The development of spiritual life is inseparable from certain social historical conditions. There are many impact factors, social productive forces, the mode of production of material life and the development situation of science and technology, which may restrict and influence the development and characteristic of spiritual life. The rapid development of network information technology is one of major characters. On the issue of the influence of network information technology's rapid development on human society and its development, the current research mainly bases on the material life style's influence. There is not so much research on the field of mental world's influence of network information technology, especially among the college students group which is the largest part of network using

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people. Thus, on the basis of presenting the content of network information technology briefly, the essay analyses and introduces college students' spiritual life under network technology.

## **2 Network Is the New Space of College Students' Spiritual Life**

### **2.1 General views on college students' spiritual life**

College students' spiritual life is, on certain social historical conditions, college student group implement, facing their inner world, a series of practical activities to answer their spiritual demands. Meanwhile, it is a kind of specific modality through which college students pursue the meaning and value of life initiatively and illustrate the essence of their existence. The college students' spiritual life represents the cognition, action and condition in their value choosing, knowledge obtaining, morality practicing, culture evaluating, emotion experiencing and entertainment appreciating. College students' spiritual life can show their mental outlook, embody students' spiritual value and reflect the essence and meaning of campus life.

### **2.2 College students' spiritual characteristic on network living space**

College students meet their mental needs of obtaining information and gaining knowledge through the network. The present network has been a huge virtual library and a kind profound instrument. College student may obtain lots of information and knowledge by using the internet at home. As a survey showed that 52.3% of information comes from the internet directly or indirectly, if they need material, what the 82.5% of students would first call to mind is the internet, and there are 86% of the student visit some subject websites or material websites which are related to study. In 2009, as the questionnaires of college students' web actions in Xi'an showed that there are 21.6% of the students often log on campus website and look for some useful campus information, 31% of students choose to collect paper material through the digital library, 49% of the interviewees think that the internet benefit them a lot to their study. However, there is only 10% of the student view that the internet benefits them a little. The survey result bespeaks that network has been to be the main platform firmly and prominently for college students to obtain learning information, and has received positive affirming.

College student voice their pursuits of freedom and equality on the internet. As a survey shows that, facing the question of "what is the biggest superiority of the internet do you think", their answers range from freedom (47.2%), free charge (20.3%), equality (18.5%) to efficiency (14%). We can see how strong college students' yearning for the freedom and equality. There is 47% of student participate the voting activities on the internet, they exchange their idea, present comments on the social issues or political issues and express their appeals through the campus BBS, QQ groups or micro blogs. In addition, there is 14% of student often post messages for college's development and self-accomplishment at the virtual forum.

College student show their spiritual features of upholding personalities and pursuing fashion on the internet. Take their "net language" for example, recent years, there are a lot of concise, humorous, vivid and creative net languages appeared. Such as "ou"(a kind lively say to me), "dongdong" (means things), "zaozhuan"(means writing by heart), "7456" (means "I angry very much"), "886" (means bye-bye) and so on. These words and phrases are very popular with its vanguard, fashion in college students, and give a chance to experience a different life style and a different self. "In 2011, as the questionnaire among seven universities' student in Hubei province shows that 90% of student use the net languages during chatting by QQ or post messages at the BBS forum, 63.2% of student is familiar with the popular net languages and have their words at hand."<sup>[2]</sup>

College student may experience the dynamic, fashionable, rich, visual spiritual recreation. Net film and net TV, online game, online chatting are the main net recreation for college students. Novel and exciting online game, fair-sounding net music, dynamic and abundant video, various network novels, all these things have very strong attraction to college students. "In 2009, as the questionnaire among partly college students in Chongqing shows that 77.4% of student choose recreation as their major activities on the internet, and nearly 18% of student choose online game among these recreation, and the rest people choose chatting, listen music and watching movie as their main recreation style."<sup>[3]</sup>

## **3 The Network Information Technology Influence College Students' Spiritual Life**

College student is the largest group among cyber citizens. Therefore, the internet has an abroad and deep impact on college students' spiritual life.

### **3.1 Network information technology innovate the manner of college students' spiritual life**

#### **3.1.1 Innovation of knowledge style**

Study is the major part in college students' spiritual life. Learning from teacher in classroom is the main access to acquire knowledge for student before personal computer is available to them. Different professors receive mixed feedback under this kind of knowledge style for the sake of its single form, limited content and the time lag. Thanks to the rapid development of network information technology, the internet and its abundant resources have been the principle access to knowledge for college students. In the endless knowledge world created by the network, College students may obtain various kinds of information, broaden horizon and improve their knowledge structure by using these resources. Meanwhile, students can keep the same state of the time and space with the knowledge publishers by its improvement of the time lag. In addition, student could learn ideas from different professors on the internet, and voice their own opinion during communicating with the same interest people on the internet. The broadest possible group can publish their views and present questions on this platform. Network is just like the latest classroom in which many professors are the teachers and the utility media are the new study forms. College students' new knowledge style has subverted the convention under this internet environment, and this tendency must be deepened by the developing network information technology.

### 3.1.2 Innovation of speaking manner

Language is a man of the inner spirit external expression. The speaking manner can reflect college students' spiritual life style partly. Compared with traditional expression manner, such as talking face to face, letter and writing, the network technology has profoundly altered the way on which college students express. Making personal website, opening blogs and QQ zones, or using podcasts, all these have been the new speaking manners among college students. They can chat with friend by QQ, MSN, Micro blogs or Fetion. These manners gathered words, videos, audios, photographs and many other forms, college students can present thoughts, exchange academic views and spread friendship through these manners. In addition, the important significance of these manners also bespeak they remove the influence of the status and offer an equally space for college students to express the true individual. Recent years, many college students consult and communicate by the campus BBS, they'd like to offer help and consult through these network speaking manners. Thus, the network information technology creates those new speaking manner, simultaneously promote college students to develop the sense of equality, lenience and open.

### 3.1.3 Innovation of recreation manner

Recreation is a state of spiritual life. It is more like a wind vane for the material well-being modern citizen. Before the internet is available to college, no matter it is college students learned ballroom dancing in 1980s and 1990s or collective outing. No matter it is reading quietly under the point of enriching their spiritual life, or playing Mahjong and pork to kill time. No matter it is thinking during reading, or listening to broadcast and watching TV. College students' recreation manners are the continuation of the traditional way of entertainment in China society. The present network is a complex which gathered words, photographs, audios and videos. It is a diversified recreation platform on which filled with many wonderful articles, colorful pictures, melodious songs and vivid videos. It can see, hear, say, sing, dance simultaneously. The recreation manners on network have a great attraction to fashionable and creative college students. Thanks to the network, students' creation is no longer a single color. Listening music, playing computer games, reading news, chatting or even shopping on the internet, all these are the expression form. College students make full use of the internet to choose spiritual and cultural products which they like. And they achieve the purpose of entertainment by different recreation manners.

## 3.2 Network information technology probably dispel the meaning of college students' spiritual Life

College students are probably dominated by "digitized facility", becoming a simplex "digitized man". The network can simplify the material world into "bite", and the meaning in philosophy of this kind of simplification is human nothingness. When the information technology, characterized by the internet, bring human to step into powerful network world, "Since people dedicate into digitized circumstance and break away from the 'present' social relation too long, they regard themselves as pure 'bite'. .... And step into the process of digitization so that make themselves into one-sided man."<sup>[4]</sup> "The dependent relation between human beings in reality is replaced by the network one, both the word and action are transferred into binary language on the internet, and people's emotions and appearance spread on the screen by the digital way. As a result, human become the digital existence."<sup>[5]</sup> College students are at a passive and controlled position because they dedicate into digital circumstance and dominated by the 'bite'. Thus, they are easily indifferent to everything and their senses of justice and morality are easily numbed by the 'bite'. Finally, they probably lose themselves when live in the so-called free space

which controlled and monitored by bite and number. The communication relied on network makes college students wouldn't like to or even can't talk with others face to face sincerely. Their emotional world may easier be closed and cold when the essence of communication becomes the exchange between students and computers. Recent years, most of the students who have internet addiction often are accompanied by cold emotional world. They are gradually becoming the "hollow man" who has no life goals and value orientation under the controlling of internet. The network information technology excessively expands the thought of scientism among college students.

The network information technology leads college students' thought about "science supremacy" excessively broaden, and causes the instrument rationalism trespass upon value rationalism. The main characteristic on the powerful attraction of the network world and the students' pursuit to technology and fashion probably makes the students over worship the science under the influence of network information technology. Meanwhile, regards the science as the only standard of value to measure social improvement and people's overall development. What's worse is that many Chinese colleges' shortage on the education of science and human thought for a long time increase the number of this one-side thought. In addition, college students' curiosity and immature mind increase their interests in using technology, especially the network technology, to realize their certain psychic gratification. These psychic characters, however, stimulate them prefer the network technology and internet world. When college student think technology may take control of the whole world and run through the universe freely, they actually have become the slave of the technology, and then their value world would disappear in spiritual life.

The network information technology cause college students trend to sense experience and lack of the thinking on things' essence and meaning. The network brings people abundant information and the enjoyment of colorful life and partly replaces people's firsthand experience simultaneously. "The network makes people's inner individuals have a general and superficial touching with the outside world, and far away with the core of personality."<sup>[6]</sup> The back of recreation and entertainment reflects its plane, shallow and vulgar characteristic. The dedicated students trend to the sensory stimulation, which often becomes college students' value target. When the happy or unhappy on sensory becomes the standard to measure realities and values, however, life must lose all its meanings and values. The direct and visual acceptance way on the internet aggravates the tendency which views things emotionally and shallowly among college students. Meanwhile, it affects, to some extent, students' rational thinking, causes students lack of rational analysis to things' essence and meaning, and discard the mode of thinking through which students may think and query the essence. Rudolf Eucken point that "If man can not pursue a lofty goal by relying on a kind of higher power than human himself and realize themselves more fully than sensory experience on the way to advance, life must lose all its meaning and value."<sup>[7]</sup> What's above the network information technology is the college students' excessive pursuit and experience to material and sensory stimulation. Its company, however, is the decline of life.

#### 4 Conclusions

With the development of the internet, the youth, who were born after 1977 and lived in the digitized environment, have been the first generation. Their life style and behavioral pattern embody sharply the characteristic of networked and digitized living logic. Thus, the network information technology has influenced college students' spiritual life deeply and widely. In this special net world, college students' value conception, social psychology, spiritual status, mode of thinking, knowledge structure, moral integrity and aesthetic sentiment have changed greatly reflected by their daily study, association, communication, recreation and entertainment. In a word, the network information technology make the internet become the new space of college students' spiritual life, innovate the mode of college students' spiritual life, but it also cause the side effect that it probably dispel the meaning of college spiritual life simultaneously.

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## Discussing Ideological and Political Education's Attention and Guidance on College Students' Personality Development

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**Abstract:** College ideological and political education should pay attention to the personality development under the students' intergraded development, and should always show respect on their thought freedom, independent personality, value pursuit and life dignity. While currently some students lack correct recognition of individual character development, colleges and universities still have some dissatisfactory exist in the respect of education and guidance, these affect health development on colleges students personality. College ideological and political education work should "people foremost" and actively guide college students personality development.

**Key words:** College students; Personality development; Ideological and political education

### 1 Introduction

General Secretary Hu Jintao put forward on the celebration of Tsinghua 100th anniversary of assembly on April 24, 2011: Hope that the mass of youthful students combine integrated development with personality development. In developing personal interest and potential advantages and on the basic of correctly managing individual, collectivity and social relationships to keep your character, ecru reveal, strive to be an eminent personage who can be of great use and undertake heavy responsibility. It expressed his eager expectation for contemporary college students, as well as higher requirement for college ideological and political education work.

### 2 Problems Existing in Contemporary College Students' Individual Character Development Education

The main trend in the aspect of contemporary college students' ideology and politics is positive and healthy. They generally support leadership of Chinese Communist Party, they are full of high and hot patriotic feelings, support the fundamental policy of the Nation and the Party and, they are proud of every achievement that their nation have made; They care about current political affairs, positive participate in discussing on all kinds of social phenomena, giving their own thinking, putting forward their own opinions; They keep aggressive actively, follow the pulse of the times closely, and have possessed modern consciousness to adapt to market economy; They are pragmatic and independent, seek individual gifts development and self-worth realization; they are broad interests, character lively, sociable, broad knowledge, pursue healthy, helpful and colorful cultural life, they carries vivid time feature during their growth and development. Recent years, however, with economical, social, cultural and educational environment changing, personality development of college students is suffering an profound impact; they demonstrate a new change and feature in the aspect of their outlook on life, value, moral, and life attitude and so on, this promotes college students' subject consciousness arousal and personality development, yet causes new conflict and problem to appear.

The big environment of market economy conditions intensifies the college students' subject consciousness and personality characteristics, makes their subject consciousness and personality characteristics vivid, makes students attach more importance to free concept, independent consciousness and completive consciousness, value natural abilities training, and dare to appeal and expression, reveal independent personality, makes students not depend on others and dare to hold critical attitude to many things. However, it will easily lead to collective consciousness and organizational principle concept be declined, and solitary attitude in handle interpersonal relationship, the formation of due unity, friendly and mutual trust become difficult, thus lacking the consciousnesses and abilities of mutual cooperation. Meanwhile, they don't possess mature psychological quality and tolerance capacity, and they do not have strong identification ability and mental adaption, once there are problems in their mind, study, life, and emotion, it will be very easy to cause psychological unbalance and result in all kinds of unhealthy psychological problems. While due to some students' lacking of correct personality development attitude in their personality development, it appears aimlessly pursuing personality, ignoring personality improvement, indulging individuality demand and so on problems, which finally

makes students deviate from the individual character development direction and orbit.

In the meanwhile, Traditional college ideological and political education has preference for emphasizing on personal function for the social development, but ignores individual function for aspect in promoting students' personal freedom development. Traditional ideological and political education emphasis more on commonality cultivation but less on personality cultivation; emphasis more on social status but less on personal demand of students; Pay more attention to the obligation undertaking but less attention to the rights defense; Pay more attention to tool value of social service but less attention to terminal value. Therefore, in operation practice level, too much attention is paid to the uniform, but personality development is ignored and little attention is paid to students' individual difference, it cannot make students improve themselves according to their personal characteristics. Because of this kind of guiding ideology, traditional college ideological and political education one-sided highlights the leading role of educators, ignoring the students' subjectivity characteristics. Simply regarding educator as the unique subject in education process and the educated who negatively accept education as object of education, enforcement phenomenon often happens in ideological and political education process, emphasizing one-way cramming on education content, thus making the educated become passive object who has no independence and who lacks creativity. So it cannot take full advantage of the effect of which ideological and political education inspires students' subjective initiative, and seriously frustrate students' enthusiasm for ideological and political education, and the spirit of independence, aggressiveness, bold innovation, and responsibility that students have cannot be given best cultivation. Currently many colleges and universities have misunderstanding and deviation in the comprehension for students' personality development, particularly in the relation between students' comprehensive development and individual development. They often ignore the organic link of the promotion of students' comprehensive moral, intelligence, physics, and beauty development and the promotion of their personality development, and separate comprehensive development from personality development even make them opposite. Respecting for and encouraging students' to develop personality is emphasized, while at the same time the guidance for the comprehensive development is left, even regarding the respect for students' personality development as what should be blamed on to give up the request for students' comprehensive development.

### **3 Positively Guide College Students' Personality Development**

Problems happening on college students' personality development doesn't simply reflect that some students lack correct understanding problem of personality development, it also reflects that colleges and universities is left behind in education and guidance. It is the problem that appears under new situation in college students' personality development as urgently needs significant ideological and political education work attention

Strengthen attention and guidance for college students' personality development cannot be empty talk, it must be taken into effect and stressed to educate and guide in practice. Only if better settle down the guidance problem in practice can it real work. The ideological and political education should grasp the dialectical relationship between comprehensive development and personality development according to the problems existed in current college students' personality development and take effective measures, exploring actively in practice and striving to reinforce the attention and guidance for students' personality development.

#### **3.1 Tempering justice with mercy and keeping relaxation balance to build a environment for college students' healthy personality development**

Ideological and political education on students' individual personality development guidance lies in guiding and controlling the correct way in which their characteristics develop. Therefore, when dealing with students' personality development, it should keep a necessary tension between strict requirement and encouraging development, setting up an education environment which is consistent with the above two. First, ideological and political education should set social and universities' "Generality" as framework of students' personalizing development, and it must be strictly required and constrained to point out the premise and direction for students' character development when it comes to the serious problems on view of life, world view, values and ethics; it should seriously emphasize on strict management and training their collective consciousness when it comes to problems on school orders and organizational disciplines. In the meanwhile, it should built a growth environment which is beneficial to students' personality development, By providing relaxed academic atmosphere, holding rich and colorful education interactive sports, cultural and artistic activities, etc to provide students with environment to develop personality demand and stage to show personal talents, and cultivate spirits of

students' self-confidence, self-independence, self-improvement, self-respect and conscientiousness, promote the students' main body consciousness and the formation of the independent personality, make the students' individual character to obtain the full development.

### **3.2 Cultivating the bold innovation character and courage**

China's socialist modernization construction needs rich individual character and diverse talents, college students to be the carrier inheriting knowledge and specific group developing career, shouldering historical mission of building the state and reviving the nation. Therefore, this group must possess innovation consciousness and spirit. Innovation is the nation progress' endless power, only innovation consciousness training can pour infinite energy into whole social development and change. Contemporary college students have great curiosity, active thoughts and they are free from constraints; possess advantageous environmental condition and knowledge reserves in campus which is the best time to innovate boldly. Students must be cultivated to have the innovation consciousness, it has to be constantly training their own innovative thinking, no matter content or way, thinking or concrete practice, should create own characteristics by using cultivation and development of personality. That neither going for blind to faith authority nor treading as on eggs and dare try to explore issues in distinctive approaches is the most precious individual character that college students have, as well as fundamental element that motive yourself to grow and be useful

### **3.3 Attaching importance to fit into team and social responsibility**

One's personalized development is not isolated from social group, human as an individual must fit in social organization, must participate in group work. Therefore, as a college student of personalized development who wants to be excellent talents must have group consciousness and cooperation spirit, on the contrary he or she is not able to fit in future organization's demand and social development. Personalized development is not developing without target and direction, in which it needs constantly revising and adjusting, it needs people and societies' approval and appreciation, Only the personalized development which fits in group can get the closest and fastest attitude feedback, get people's attention, understand, approval, respect and appreciation, form a sound interaction between individual and group, and realize special self-worth and social value. The development of personality on condition that it adapts to social development and organization demand, in no way does it go against public cooperation spirit, public order, collective interest and the social responsibility, everyone's act must regards respecting others and undertaking social responsibility as premise. Therefore, college and universities can either straightway organize students to take a part in collective activities and social public welfare establishments, or indirectly organize students to participate in all kinds of activities through college students' club activities so as to organically combining personality development and group consciousness with social duty.

### **3.4 Guiding students to improve comprehensive quality and perfect personality development in social practice.**

College students' social practice is a good form to get out of school, into society, touch society, understand society, and devote into society, as well as effective approach to cultivate the development and improvement of their personality. Through various forms of social practice, college students experience social life outside campus themselves, through emotional cognition to let them have a rational thinking on reality and future problems and promote the self-introspection and the self-adjustment for their own acts and character qualities. In the meanwhile, social practice also extends students' view, promotes selective space and gains time for adjustment and preparation, offering the precious practice chance for cultivating and developing their personalities and interests. In addition, the ideological and political education workers should be in the social practice process timely follow-up, listen to the students' awareness and opinions, understand their comments and thoughts fluctuation, answer questions and confusion in their heart, to help them overcome the difficulties and obstacles, promote them to understand the world, understand themselves, will tempering, exercise characters, develop characteristics, enhance autonomy consciousness, develop self-discipline quality, make great efforts to perfect personality, and comprehensively improve overall quality.

## **4 Conclusion**

College students as a certain group, have both the group generality and personality difference. This kind of individual difference decides that college ideological and political education should not simply request students' integrated development but ignore their individual character. College ideological and political education must insist on "people foremost", not only comprehensively improve the overall

quality of students, pursuit integrated development, but also respect subjectivity of right of every student, keep an eye on the external circumstance and internal world of the heart during their development, manage to be close to every student's living, close to individual thought reality, and solve problems existing in the process of college students' development one step at a time.

College ideological and political education must first respect the characteristics of students, and respect their freedom thought, independent personality, pursuit of value pursuit and life dignity from beginning to end. In the process of education, pertinence of education must be improved according to the characteristics of students as to make the education content more profitable, to make the education methods more actual, and to make the progress more reasonable. In individual education, it should vary from person to person, vary from situation to situation, teach students according to their aptitude, analyze case by case and make students' problems existing in their real study and living solution targeted. College ideological and political education should also combine organically students' characteristic development with potential personality expression exploring, bring the self-consciousness and initiative of students and set up their self-confidences to further foster the individual creation and practice abilities, to protect students' initiatives and creativities; Actively guide them to develop their own characteristics and gifts, put an emphasis on improving students' spirit of keeping forging ahead, perseverance of overcoming difficulties, learning ability of actively developing personality and viability.

Human value is organic unity of "Social value" and "self value". On one hand, Society should create conditions as much as possible satisfy the development of individual characteristic and talents; on the other hand, individual also should be responsible to society through hard working, and devote our talents and intelligence as we can. College ideological and political education should respect college students' personalized demand and plural value orientation without one-sided emphasis on social value, ignoring even denying individual value; also it should help college students to actively withstand all kinds of negative thoughts and adverse effects, to make college students understand the dialectical unity of personal value and social value, personal development and social development, making college students stick to positive mental attitude, adhere to pursuit the ideal and faith of truth, kindness and beauty, and cultivate their own lofty goal in life and sense of responsibility through the correct guidance of college ideological and political education.

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## Decoding the Misuse of Open-Choice Principle in Chinese-English Translation with the Search Engine—Google\*

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**Abstract:** Translation from Chinese to English for a non-native English speaker has long been a great difficulty and thus leads to various mistranslation problems. Most of them are caused by the misuses of English collocations. This paper takes a Chinese essay and its English-version translations as the object and adopts the search engine—Google to help retrieve the accepted collocations and fixed expressions and thus to identify the mistranslated parts of the essay. As a result, the paper finds that most English learners in China are unconsciously misusing Sinclair’s open-choice principle in translation, because they lack of prefabricated chunks so that they don’t know how to correctly put different collocations together. At last, it concludes the real reason for the mistranslation problems and gives practical suggestions for English learners.

**Key words:** Collocation; Open-choice principle; Chinese-English mistranslation; Google search analysis

### 1 Introduction

The term ‘collocation’ was first introduced by Firth<sup>[1]</sup> as the level of meaning created in language independent of the ideational concepts of the individual words or the contextual level of meaning to be derived (pragmatics). Defining this level of meaning created by word combinations or patterns, where the pattern or ‘co-location’ with other words can actually create the meaning of a given word, he states “You shall know a word by the company it keeps”<sup>[1]</sup>. Another definition of the concept he offers is “collocations of a given word are statements of the habitual or customary places of that word”<sup>[1]</sup>.

In line with the Firthian tradition, further awareness of collocation at an empirical level was brought to the forefront by analyzing language statistically via large computer-based corpora. Sinclair, who defines collocation as “the occurrence of two or more words within a short space of each other in a text”<sup>[2]</sup> led the COBUILD corpus project which led to, among other things, innovations in lexicography and dictionary design informed by corpus evidence in order to take more into account commonly found collocation and lexis behavior.

One of the lasting concepts to have grown out of this research is Sinclair’s distinction between what he terms ‘the idiom principle’ and ‘the open-choice principle’. ‘The idiom principle’ observes that language is largely systematic in that “... a language user has available to him or her a large number of semi-preconstructed phrases that constitute a single choice, even though they might appear to be analyzable into segments”<sup>[2]</sup>. This is what is meant by collocation in the broad sense. ‘The open-choice principle’, in contrast, sees slots in a grammatical framework being filled more arbitrarily, thus a ‘choice’ of words being made at each turn limited only by grammaticality.

Sinclair posits that users of a language use both principles, but rely on the open choice principle only when the idiom principle fails. This insight has serious implications for pedagogy such as a structural approach that presents only ‘the open choice principle’ and focuses on grammar determined by sentence or phrase structure ignoring lexically determined behavior or restrictions.

Using the word ‘grammar’ in a lexically centered sense, Michael Lewis<sup>[3]</sup> observes that “every word has its own grammar ... (and) ... ‘knowing a word’ involves knowing its grammar -the patterns in which it is regularly used.” In this way, the ‘collocationist’ view of language sees “the predictability of the co-occurrence of words in the slots that constitute the underlying structural frame”<sup>[3]</sup>. and with obvious relevance to the language learner, recognizes these combinations and/or ‘chunks’ as an important part of the mental lexicon. Furthermore, collocational competence is said to provide an efficiency of effort, or fluency in terms of both decoding and encoding language in that it allows learners to process and produce these chunks at a faster rate as well as convey more easily complex ideas that are

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① According to Wikipedia, Google Search is the most-used search engine on the World Wide Web, receiving several hundred million queries each day through its various services.

often expressed lexically<sup>[3]</sup>.

Learners can deploy approximated ‘open-choice principle’ language to communicative ends, but appear stuck in terms of improving fluency because of their not possessing an awareness of, or perhaps an appropriate level of acquisition of collocation as The Oxford Collocations dictionary for students of English defines it, “the way words combine in a language to produce natural-sounding speech and writing”.

Translation is not simply to find equivalent expressions in the source language and the target language. It is a process of transferring cultural information and linguistic features from the source language to the target language instead. Chinese translators have long been influenced by bulk of factors, many of which lead to mistranslation, while, the open-choice principle is one of the good ways to decode the mistranslation problems.

## 2 Empirical Study and Analysis

In this section, the author uses a Chinese essay and its English-version translation as the study object and analyzes the mistranslation parts by the adoption of Google search engine. The essay this paper took came from China Daily BBS. China Daily is one of the most famous English newspapers in China. There was a translation competition on the BBS and many English learners took part in it (<http://bbs.chinadaily.com.cn/viewthread.php?tid=552705>). The author selects some of the sentences as the study objects and uses the open-choice principle together with the Google search engine to analyze the mistranslation problems. All the data obtained from Google has been updated on April 22, 2012. Furthermore, after making an explicit analysis of each example, this paper also gives a correct translation sample for each wrong one.

### 2.1 Correct collocation checked by Google

【Translation】 The earliest brands *can be dated back to* the early days of China and Egypt.

As we know *date back to* is a set phrase interpreted by the idiom principle, so its passive form—*be dated back to* can also be considered as a set phrase. Needless to say, it’s a correct collocation. Actually, we can also use Google to check it if we are not so sure whether it is a set phrase or not. Let’s first turn to Google for the frequencies of the word group *can be dated back to*.

**Table 1** Frequencies for Can Be Dated Back to

No. of Words	Fragment	Google Hits
1	Can	15,530,000,000
2	Can be	14,810,000,000
3	Can be dated	191,000,000
4	Can be dated back	166,000,000
5	Can be dated back to	132,000,000

From the frequencies listed above, we can see that the table demonstrates the relations between words and word groups within this fragment. For instance, there are approximately two bands of frequencies between the five word groups: two in the billions and three in the millions. Therefore, we can clearly find out that the words in the same frequency bands seem to have a closer bond with each other than with other words in the fragment.

According to Chi-Chiang Shei<sup>[4]</sup>:

1) when the number of words increases in a fragment, the frequency of the overall fragment decreases;

2) when a new word is added to a fragment and the frequency line remains stable (i.e. level), that word is closely bound to the word within a fragment which it is attached to, and the overall fragment may be considered formulaic.

3) when a new word is added to a fragment that causes the overall frequency to precipitate, the overall fragment can no longer be considered formulaic.

Based on the above mentioned principles, it can be easily seen that *can be* and *dated back to* are closely bound to each other respectively within the group, because when the number of words increases in a fragment, the frequency of the overall fragment decreases continuously and stably. Therefore, the entire fragment is reasonably formulaic. In other words, it is a good translation from Chinese to English.

However, the following examples are different. From Table 2 to Table 4, this paper examines the misuse of collocation in different translation versions and finds out that these English learners lack of

prefabricated chunks so that they tend to misuse the open-choice principle and put different words together, which easily leads to Chinglish and mistranslation problems. Now, let's come to the examples with wrong collocations in the translated sentence.

**2.2 Misused collocation No.1**

【Translation】 With the globalization of brands and the internalization of global competition, foreign brands are *making unceasing effort in* attacking the China market.

When we translate the above sentence and are not sure about the italicized part, we can try Google to check whether it is done correctly. The author searched on Google and found the following result about the word group *make unceasing effort in...*

**Table 2 Frequencies for Making Unceasing Effort in...**

No. of Words	Fragment	Google Hits
1	Make	1,510,000,000
2	Make unceasing	3,880,000
3	Make unceasing effort	2,120,000
4	Make unceasing effort in	4,080,000

By taking the above mentioned theory to analyze Table 2, we can get very clear and informative results; that is, *make* and *unceasing effort in* are not closely bound to each other due to the reason as follows:

When the number of words increases in a fragment, the frequency of the overall fragment first decreases from 1,510,000,000 to 2,120,000; then it begins to increase and finally stops at 4,080,000, which means it cannot keep table. That's to say, the translation is not a good one.

As we know, *unceasing* means "continuing forever"; however, the original sentence indicates that "with the globalization, more and more foreign brands influx into China and thus bring in great threat to local brands". It doesn't mean the foreign brands will come into China forever. Therefore, *unceasing effort* is not a good choice for the translated sentence. The author hereby suggests to change it into "make continuous effort in...", which well matches the meaning of the original sentence.

**2.3 Misused collocation No.2**

【Translation】 Many businesses in our country are wholeheartedly *fighting beachhead for the* share of the international *market* and metropolitan areas...

Some collocations seem correct in a certain discourse. However, they are sometimes misused by English learners, for they don't know the proper context for the phrase. And we can also use Google to check it under such a situation. The following table shows the result that the author searched on Google about the word group *fighting beachhead for the ...market*.

**Table 3 Frequencies for Fighting Beachhead for the ... Market**

No. of Words	Fragment	Google Hits
1	Fighting	902,000,000
2	Fighting beachhead	901,000
3	Fighting beachhead for	901,000
4	Fighting beachhead for the	901,000
5	Fighting beachhead for the...market	2,830,000

Based on the principles quoted above, Chi-Chiang Shei<sup>[4]</sup> infers the following results:

1) when the number of words increases in a fragment, the frequency of the overall fragment fluctuates;

2) when a new word is added to a fragment, the frequency cannot keep stable;

3) when a new word is added to a fragment that causes the overall frequency to increase, the overall fragment can be considered formulaic.

From the above table 3, we can say that *fighting beachhead* and *for the ...market* are not closely bound to each other, because when a new word is added to the fragment, the overall frequency fluctuates, which not only decreases from 902,000,000 to 901,000, but also levels at 901,000 for three times and then increases to 2,830,000. In other words, this overall fragment is not formulaic. However, Thus, it is not a good translation.

Actually, *beachhead*, in English, means "an area of shore that has been taken from an enemy by



force, and from which the army can prepare to attack a country”. It is obvious that *beachhead* is not a proper word for the original text. Therefore, we can change the translation into “Many of our enterprises (businesses)are obsessed with the idea of nudging into the international market and metropolitan areas...”.

#### 2.4 Misused collocation No.3

【Translation】 Many powerful foreign brands are trying a thousand ways to *make a fuss about the Chinese rural market*.

The author searched on Google and hereby presented the result about the word group *make a fuss about the ...market* in the following table.

**Table 4** Frequencies for Make a Fuss about the ... Market

No. of Words	Fragment	Google Hits
1	Make	1,510,000,000
2	Make a	8,180,000,000
3	Make a fuss	44,500,000
4	Make a fuss about	56,800,000
5	Make a fuss about the	44,500,000
6	Make a fuss about the...market	52,800,000

Table 4 shows us that the frequency from No.1 to No.6 fluctuates much. Therefore, based on the same reasons the author listed above, we can say that this word group is not a correct collocation, either. In fact, according to Longman Dictionary of Contemporary English, “to make a fuss” means “to complain or become angry about something, especially when this is not necessary”, whereas the collocation is not suitable for the original sentence. We should change the mistranslation to “Some well-established (strong)international brands are constantly racking their brains over China’s rural market”.

### 3 Conclusion

Generally speaking, English learners in China do not have enough prefabricated chunks, that’s to say, they don’t know how to use the idiom principle; so when they translate from Chinese to English, they tend to put different collocations into one word group according to their understanding.

It seems that they are following the open-choice principle; however, in fact, they are misusing it. That’s why many of the English-version translation sound like Chinglish, which only part of the Chinese English learners can understand, but not the native English speakers. Therefore, Chinese English learners should obtain as many idioms and collocations as they can, so that when the idiom principle doesn’t work, they can also correctly use the open-choice principle to make acceptable word groups and sentences. Fortunately, the search engine—Google plays an important role in helping the English learners in China for checking their word choice as well as improving their English proficiency.

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# A Diachronic Study on the Construction of Ecological Awareness in Newspaper

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**Abstract:** Ecological awareness is the concern hold for ecology and environment. It needs to be cultivated through the criticizing of anthropocentrism and growthism, which have been accepted by people from the ancient time. As a result, the establishing of ecological awareness is very difficult and challenging. This paper, by analyzing 129 reports on the theme of Genetically Modified Foods from The New York Times, attempts to study the way of constructing ecological awareness in news paper and how it is changed diachronically.

**Key words:** Ecological awareness; Newspaper; Genetically modified foods

## 1 Introduction

News paper is an indispensable part of life. It disseminates information, it teaches knowledge, and it also guides public opinions. Hachten once said "all press systems reflect the values of the political and economic systems of the nations within which they operate"<sup>[1]</sup>. By this, Hachten most probably means that the press or the mass media in general, has a value, but not of its own: it is the representative of the political or economic systems of the country under which it exists or of the interest which it represents.

Critical Ecolinguistics emerged in 1990s with Halliday's keynote speech at the 10th AILA as the landmark in Greece in 1990. Critical Ecolinguistics is also addressed as Ecocriticism of Language and presupposes two points: the language system embodies cognitive thoughts of ecological problems; the cognitive thoughts in a language system exert impacts to the ecological awareness of language users.

The theory analyzes language and discourse from an ecological angle with an aim to uncover thoughts unhelpful to ecological environment thus cultivating people's ecological awareness. In so doing, the theory attempts to criticize anthropocentrism and growthism in language system, especially in the lexical system and grammar.

After Halliday, Goafly and Trampe criticized language through an ecological angle. Goafly expressed his objection of the systematic-functional approach because he thought the approach divided a process into 3 parts thus breaking the integrity of the universe. Trampe criticized anthropocentrism and commercialism.

In recent years, people are increasingly concerned with environmental issues and ecological problems, and they are showing more considerations on what their daily conducts might do to the ecological surroundings, which they seldom or never did before. Is people's growing care to ecology resulted from the recent propaganda of media, which adjusts the stereotypical views of people being the center of the universe thus removing the ignorance about ecological environment?

This paper, with the help of Critical Ecolinguistics, attempts to figure out the questions: Is an ecological awareness constructed in news coverage? If so, how it is constructed and how it is changed diachronically?

## 2 Data Collection

In order to figure out the answers to the proposed questions, the thesis chooses The New York Times as a representative of news paper and the resource of research data. The data are collected with the key words "Genetically Modified Foods" thus involve 129 pieces of reports ranging from the year of 1986 when genetic technology initially known to the end of 2011. The following part elaborates what motivates the choice of the New York Times and the sampling of the research data.

### 2.1 The reasons for deciding the medium—The New York Times

The New York Times is an American daily newspaper founded and continuously published in New York City since 1851. The print version of the paper remains both the largest local metropolitan newspaper in the United States, as well the third largest newspaper overall and long regarded within the industry as a national "newspaper of record". In a word, The New York Times is a widely-circulated, easily-accessed and long-existed medium with profound influences among the public. The reports in it are surely loaded with significance to be studied to identify the construction of a particular awareness in

a diachronic way.

**2.2 The reasons for choosing the topic**

Genetically Modified (GM) food is a tentative use of Tran genetic technology in the field of food production. This technology originally is invented to overcome some intrinsic defects of a food so that the food can be “improved”<sup>[2]</sup>. For example, corns cannot resist pests themselves nor resist drought for a long time. However, after being added some genes from other species which possess traits of overcoming the shortcomings of corns, the “new” corns will become pest-resisted and drought-resisted. Apparently, this is a good technology; however, as the added genes can be any genes from all species including either plants or animals, it may have great potential dangers for people’s health if it is used in food production. What’s more, GM food is not reproductive and usually with high yield thus have possible harm to environment and ecology.

Genetically modified Foods are highly related to technology which is rarely known by common people if without the information and knowledge from media. That is to say, all the reports on this topic can best explain how they construct awareness and how they influence people by demonstrating the awareness in the reports.

On the other hand, the debate on the safety of GM foods involves struggles over power between the most powerful state and the almost weakest country in the world. But there has not been any analysis of language and linguistic features of the report on GM food in all relative press. So, people never know how the press works to construct a particular awareness.

What’s more, owing to the intrinsic traits of GM foods like uncertainty of safety and heavy reliance on the inventors, the hot issue is not merely relative to the technology itself, but to the field of economics and politics. The topic is thus far more complex than others. It is just the complexion that will make corpus possesses more significance to answer the questions proposed before.

The last but not least, Fairclough once claimed, “The selection of data should correspondingly reflect areas of variability and instability as well as areas of stability”<sup>[3]</sup>. That is to say, in collecting data, we should determine a stable point and then collect related variable respects. By this means, the variable instabilities have some common senses thus make the collected data relative each other. Here, in this paper, all the data are related each other by the discussion on the same topic.

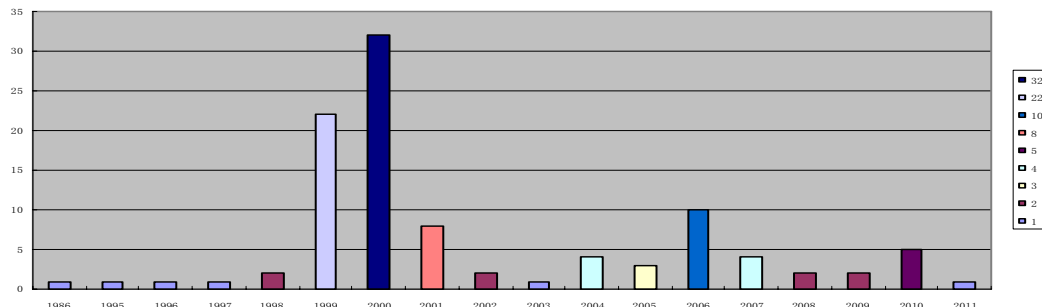
**3 Data Analysis**

As introduced previously, the research data covers 129 reports in total from 1986 to 2011. They are centering on genetically modified foods, including both the comments on the technology involved, the foods themselves and the foods to health thus being presented in different forms.

The part of analysis, with an aim to identify the way of constructing an ecological awareness, will expound both general features of the 129 reports and concrete features in content, a distribution of the content and language used. What’s more, in order to recognize how awareness construction changes diachronically, all the general and concrete features will be compared and contrasted.

By analyzing general features of the data, we can recognize the influences of social or economic systems on the report and concern of a particular issue, the genetically modified foods in this paper thus identifying the way news paper construct an awareness among people with its reporting.

**3.1 The general features of the data**



**Figure 1 The General Features of the Data**

Generally, in the 35 years from 1986 and 2011, the reports on genetically modified foods in The New York Times varied greatly. Figure 1 demonstrates the variations in a detailed way.

From Figure 1, we can see that after the initial report of genetically modified foods in 1986, another similar report occurred 10 years later in 1995. Within the 10 years, The New York Times never presented any information on either the new technology or the technology-related foods. But after 1995, every year saw one relevant report until the year of 1998. However, a sudden increase of relevant reports happened in the year of 1999 with 22 pieces of reports, contrasting with the previous 1 or 2 pieces. Then, the next year, the year of 2000 experienced the most frequently reported time on genetically modified foods with the highest number of 32. But the increasing trend did not steadily go on. The year of 2001 quickly saw the decrease from 32 to 8. From 2001 on, the low frequency of reporting continued with less than 4 pieces until 2011, within which the year of 2006 was an exception, with 10 pieces.

**3.2 The classification and distribution of the data**

In terms of content, the data can mainly be categorized into 4 sections: News report, Column, Letter and Editorial. This could be illustrated in Table I. News report is the most common form of reporting in news paper when presenting a particular view. Column is a piece of writing from a columnist who has expert knowledge in a specific field thus this section is usually informative and personal. Letter apparently is a kind of communication between readers and editors or a feedback from readers. It is mainly considered as the presentation of public opinions. Editorial, to a great extent, reflects the standpoint of the press itself.

Of all these four sections, news reports constitute the majority with the number of 102; the number of column is 6, of letter to editors is 19 and 2 are editor’s note. The distribution could be illustrated by Table 1.

**Table 1 The Classification and Distribution of the Data**

Total Number	Classification and Distribution			
	News Report	Column	Letter	Editorial
129	102	6	19	2

Table 1 indicates that besides News Report, “Letter” occurred most frequently among the four categories of the data. Especially in the year of 1999 and 2000, “Letter” appeared 13 times, which is far more from the total number of the rest of the period. From Table II, Table III and Table IV, a year should be noted with special attention. That is the year of 2000. This year not only witnessed the occurrence of every category of the four sections, but also saw the greatest number of each section. So without any doubt, reporters made great efforts in constructing an awareness this year.

**Table 2 The Distribution of Letter**

Letter	Distribution in Different Years					
	1992	1999	2000	2003	2010	2011
19	1	5	8	2	1	2

**Table 3 The Distribution of Column**

Column	Distribution in Different Years				
	1997	1999	2000	2001	2002
6	1	1	2	1	1

**Table 4 The Distribution of Editorial**

Editorial	Distribution in Different Years	
	1998	2000
2	1	1

**3.3 The content of the data**

As the data comprise of 129 reports, they are abundant in information. In considering the size of the thesis, the data are mainly analyzed from the content of the headlines.

The initial report in 1986 on genetics was titled “Genetics Concern on the Spot”, which was an overview on the new biotechnology. Then in 1992, the only relevant report was about the risks or danger of trans-genetic foods in the form of Letter. But the headline, “Mutant Foods Create Risks We Can’t Yet Guess; No evidence of Danger”, indicated clearly that the news paper was telling the public that genetically modified foods have no danger.

So this could be considered as the first phase when general information and positive aspects of genetically modified foods were mentioned.

The second phase was about the doubting and questioning of the altered foods. It covered the period from 1995 to 2007.

The report of 1995 emphasized the foods' influence to health with the title "Research Hints of Immunization via Food". The similar concern of health was also presented in 1996 titled "Genetic Engineering of Crops Can Spread Allergies, Study Shows".

Though people were concerned with health problems genetics may bring, most of them had no knowledge or information of the altered foods. So some people requested the knowing of the gene-altered foods with labeling. The headlines in 1997 and 1998 exemplified that condition:

"Biotechnology Company to Join Those Urging Labels on Genetically Altered Products (February 24, 1997)"

"Shoppers Unaware of Gene Changes (July 20, 1998)".

At the same time, the news paper questioned the significance of genetic technology:

"Can Bioengineers Feed the Planet (July 23, 1998)?"

With the questioning in 1998, the sudden increase of reports designated people's growing concern over the technology. In terms of content, the reports in the following years, including 1999 and 2000, discussed the labeling and safety of genetically modified foods and the control of the technology. The examples are in legion. The following ones are just some typical ones.

"U.S. Sidetracks Pact to Control Gene Splicing (February 25, 1999)"

"U.S. Plans Long-Term Studies on Safety of Genetically Altered Foods (July 14, 1999)"

"Now Label Altered Food (August 3, 1999)"

"Talks on Biotech Food Turn on a Safety Principle (January 28, 2000)"

"Tell the Truth About Altered Food; Profits, Not Health (June 8, 2000)"

"Food Companies Urged to End Use of Biotechnology Products (July 20, 2000)"

"Case Illustrates Risks of Altered Food (October 14, 2000)"

The third phase started from the year of 2001 to 2009. during this period, the bans or control on biotech foods won the upper wind with more reports advocating the rules of controlling the technology. The examples are as follows:

"Panel Backs Stronger Rules For Some Food (December 18, 2000)"

"Without U.S. Rules, Biotech Food Lacks Investors (July 30, 2007)"

"European Official Faults Ban on Genetically Altered Feed (November 27, 2007)"

"Europe to Allow Two Bans on Genetically Altered Crops (March 3, 2009)"

The last phase is from 2010 to 2011. This phase saw the generalization of genetically modified foods again but emphasized the negative aspects.

"Genetically Engineered Distortions (May 15, 2010)"

"Questions About Gene-Modified Foods (August 25, 2011)"

## 4 Conclusion

The general features of the data suggest that the effort of constructing a particular awareness is never the same in a long time. It could be exerted in one special time or period or time. In presenting views thus constructing ecological awareness, various forms will be used but the most common form is still news reports written by journalists rather than Letter, Column or Editorial.

From the content of the data, the reports undergo different stages: no mentioning of any ecologically related information, small amount of relevant information in abbreviation or acronyms, some information in altered or changed forms, objective mentioning of relevant information in complete form. With the examples from the reports, the stages could be explained as follows: people are the center of the universe and new technology like genetically modified foods serves people; genetically modified foods have potential harm or danger to people; genetically modified foods should be controlled with rules.

With more information presented, the relevant reports are more comprehensive thus some extreme or stereotypical views in the initial stage are adjusted or even changed completely. Reports become more objective under this circumstance.

To sum up, news coverage construct an ecological awareness. But the ecological awareness has undergone stages from none to weak, from weak to strong. The construction is realized with less emphasis on people's central position. In terms of genetically modified foods, the initial reports did not

construct ecological awareness when they only emphasized the “center” position of people and the “growth” ushered by the new technology—genetic engineering. Then, by pointing out the nature of genetics is making profit in 2000, the report criticized “commercialism” thus constructing a weak ecological awareness. After 2000, more reports questioned and criticized the “growthism” of gene-altered foods, the ecological awareness are strengthened.

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# Investigating the Relationship Between Human Resources Management Practices and Organizational Citizenship Behavior: A Case Study

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**Abstract:** This study investigates the impact of human resource management practices on organizational citizenship behavior (OCB). A convenience sample of one hundred and twenty (N= 120) employees was surveyed from twenty five different branches of Mercantile Bank Ltd. Bangladesh. The structured survey questionnaire used to seek to obtain primary information through five point Likert Scale. Linear regressions were used to analyze the data collected. The Pearson correlation results support all hypotheses stating that there is a positive relationship among human resource management practices and organizational citizenship behavior. The findings of the study indicate that the selected practice of HRM of that bank has positive relationship with OCB. Finally, this study suggest that the management should ensure the practice for the banks to develop a sense of belongingness in the mind of all the employees working together to get the desired behavior which can not be measured by monetary terms only.

**Key Words:** Training and development; Fair treatment; Promotion and transfer; Leave and vacation; Reward; Organizational citizenship behavior

## 1 Introduction

Banking industry as a service based industry concentrating to increase their customer satisfaction for achieving the competitive advantage in the long run. Most of the banking organization in Bangladesh realizing that organizational citizenship behavior can dramatically change the organization output through the employees extra role behavior and contribution which should be encouraged throughout the whole organization by ensuring sound and harmonious practice of human resources management. Why does OCB seem to have such compelling effects on the individual and the success of an organization? Organ et al. (2006) has offered the following suggestions. OCB can: (1) enhance productivity (helping new co-workers; helping colleagues meet deadlines), (2) free up resources (autonomous, cooperative employees give managers more time to clear their work; helpful behavior facilitates cohesiveness (as part of group maintenance behavior), (3) attract and retain good employees (through creating and maintaining a friendly, supportive working environment and a sense of belonging), (4) create social capital (better communication and stronger networks facilitate accurate information transfer and improve efficiency).

Mercantile Bank Limited is one of the commercial bank out of near to 50 commercial banks in Bangladesh. The Bank commenced its operation on June 2, 1999. It provides a broad range of financial services to its customers and corporate clients inside and outside of the country. The board of directors of the bank consists of eminent personalities from the realm of commerce and industries of the country. Mercantile Bank Limited has 75 branches throughout the country. The Bank has two subsidiaries namely Mercantile Bank Securities Ltd and Mercantile Exchange House (UK) Limited and a Off-shore Banking Unit to pace up the international trade especially in Export Processing Zone. The bank has a separate human resources division aim to practice successfully recruiting talent people and train them properly to cope up with the changing demand in the market and also retain them long term with job satisfaction, motivation and organizational citizenship behavior. Thus the aim of this paper is to explore the relationship between the HRM practice and organizational citizenship behavior of the employees in the bank

### 1.1 Literature review

A few numbers of researches has already done to determine the relationship between HRM and OCB in developed countries. But in a developing country like Bangladesh no significant research found on the impact of HRM on OCB in banking sector specially. Absar at. el. (2010) conducted a study to exploring the impact of HR practices on job satisfaction in the context of Bangladesh. They found that HR practices have significant association with job satisfaction (JS). In addition, human resource planning (HRP), and training and development (TND) were found to have positive impact on job satisfaction (JS). It was also

found that TND has the greatest impact on JS. Mahmud and Idrish (2011) revealed in their study on six Human Resource (HR) practices (realistic job information, job analysis, work family balance, career development, compensation and supervisor support) and their likely impact on the Employee Intention to Leave (EIL) in the Bangladeshi banks. Their research results indicated job analysis, career development, compensation, realistic job information variables were negatively and significantly correlated with EIL. Interestingly work family balance was not negatively correlated with EIL. These six variables can jointly explain 67% of the variance in EIL. Results of regressing the HR practices on EIL showed that compensation and job analysis are strong predictors of EIL. Jill Wo Graham (1991) advocated a more comprehensive understanding of job performance and organizational citizenship behavior (OCB) than that employed by earlier researchers on those topics. Using the intellectual heritage of the word "citizenship" from political philosophy and related disciplines, OCB is positioned as the organizational equivalent of citizen responsibilities, of which there are three categories: obedience, loyalty, and political participation. Two other key citizenship concepts, relational ties and citizen rights, are described, and a set of ten research propositions is offered relating the citizenship concepts to one another. Suggestions for other areas of investigation are also provided. Finally, the advantages of using OCB as a global measure of individual behavior at work are defended. Work environment, benefits and promotion opportunities has significant influence on organizational citizenship behavior (Begum and Sarker, 2012). They also revealed that only work environment has significant effect on OCB, other two variables benefit and promotional opportunities has no effect on OCB for the particular organization of research. So, Management should redesign these two variables to ensure OCB in their organizations betterment. As pointed out by many service scholars, in service-oriented or service-based organizations, human resources or employees are a crucial variable that links the firms to profits (e.g., Heskett, Jones, Loveman, Sasser Jr., & Schlesinger, 1994; Schneider, 1994, 2004; Morrison, 1996; Bowen & Ford, 2002; Anderson, 2005). Employees of high levels of OCBs are aspired in service organizations because such employees are committed to excel in their jobs and they are also able to face the unforeseen contingencies resulted from the unique nature of services (Morrison, 1996). Sun, Aryee and Law (2007) point out the role of HRM practices as an indicator of organizations' attitudes towards employees. For example, the extent to which the organizations are concerned with the employee well-being is indicated by the design of the HRM practices. These researchers propose in their study that employees' OCBs will be enhanced if they perceive there is an existence of supportive HRM practices (i.e., positive work environment) implemented by the organizations. According to social exchange theory, it is hypothesized in this research exercise that service-oriented HRM practices which are focusing on satisfying both customers and employees (Schneider & Bowen, 1993) will create an environment where employees are motivated to work for the benefits of their organizations. In one of the most widely cited article, Morrison (1996) suggests organizational citizenship behaviour (OCB) as an alternative to other customer-oriented behaviours. OCB is a discretionary behaviour displayed by the concerned employees who are committed to contribute to the positive development of the organizations (Organ, 1988). The fact that OCB can be a significant consequence of service-based HRM and it has been inferred from the studies conducted by Chebat et al. (2002) and Tsaur and Lin (2004).

## 2 Methodology

### 2.1 Objectives

The main objective of this study is to investigate the impact of some selected HRM practices on organizational citizenship behavior. Other objectives are:

- (1) To know the relationships between human resources management practices and OCB.
- (2) To explore the HRM function which most significantly influence OCB.
- (3) To give some recommendations for policy makers for future development.

### 2.2 Conceptual model and hypotheses



Figure 1 Conceptual Framework



The general form of the model was as follows:

$$OCB = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e$$

Where, OCB = Organizational Citizenship Behavior

X<sub>1</sub> = Training & Development

X<sub>2</sub> = Fair Treatment

X<sub>3</sub> = Promotion & Transfer

X<sub>4</sub> = Leave & Vacation

X<sub>5</sub> = Reward

And  $\alpha$  is constant and  $\beta_1, \beta_2, \beta_3, \beta_4$  and  $\beta_5$  are coefficient to estimate, and e is the error term.

**2.3 Hypotheses:**

H<sub>1</sub>: Training & Development are positively related to OCB.

H<sub>2</sub>: Fair Treatment and OCB are positively related to each other.

H<sub>3</sub>: Promotion & Transfer are positively related to OCB

H<sub>4</sub>: Leave & Vacation are positively related to OCB.

H<sub>5</sub>: Reward and OCB are positively related to each other.

**2.4 Sample size and sampling technique**

To fulfill the objectives of this study, total 125 questionnaires were distributed among the employees of 25 different branches of Mercantile Bank Ltd. Out of which 120 questionnaires found correct and complete. So the responses of sample 120 (N= 120) were analyzed to find the result of the study. The convenience sampling technique was used for selecting the respondent.

**2.5 Research instrument**

The main methodology chosen for this study is the questionnaire survey method. The survey was conducted from May 2011 to August 2011. Primary data were obtained through a structured survey questionnaire. Total fifteen questions under the head of five human resource management practices and four questions for organizational citizenship behavior are included in the survey questionnaire.

**2.6 Measurement of dependent and independent variables**

For the purpose of the study, respondents were asked to give tick marks on right side of different statements related to HRM practice and OCB. Dependent and all of the independent variables were measured on five point Likert scale. The response scales for each statement in the survey questionnaire were as: 1= Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree.

**3 Data Analysis**

Data were analyzed by using software SPSS- 17 version. The following statistical techniques were applied to analyze the data:

- Cronbach's alpha (Reliability test Table 1)
- Descriptive statistics and correlation (Table 2)
- Linear regression (Table 3)

**Table 1 Reliability Test**

HRM & OCB *C	Training & Development	Fair treatment	Promotion and transfer	Leave & Vacation	Reward	OCB
CA**	0.843	0.777	0.741	0.775	0.764	0.783

Source: Calculated, \*Human Resource Management and Organizational Citizenship Behavior

\*\*Cronbach's alpha ( $\alpha$ )

**Table 2 Descriptive Statistics and Correlation**

	M	SD	1	2	3	4	5	6
Training & Development	3.9000	1.04841	1					
Fair treatment	3.9333	.77496	.405**	1				
Promotion and transfer	4.0333	.83950	.348**	.675**	1			
Leave & Vacation	3.9000	1.01584	.211*	.333**	.556**	1		
Reward	4.2667	.68272	.178	.479**	.805**	.572**	1	
OCB	4.1333	.80891	.214*	.336**	.389**	.630**	.544**	1

\*, Correlation is significant at the 0.01 level (2-tailed), \*. Correlation is significant at the 0.05 level (2-tailed).

**Table 3 Regression Analysis**

Variable	R	t-value	coefficient	F-value	P-value
1.Training & Development	0.214	2.380	0.214 (0.165)	5.665	0.019
2.Fair treatment	0.336	3.875	0.336 (0.351)	15.019	0.000
3. Promotion and transfer	0.389	4.592	0.389 (.375)	21.089	0.000
4. Leave & Vacation	0.630	8.811	0.630 (0.502)	77.635	0.000
5. Reward	0.544	7.038	0.544 (0.644)	49.528	0.000

**3.1 Cronbach’s alpha**

Internal reliability of the questionnaire was tested by using Cronbach’s alpha. According to Nunnally, J. (1978) Cronbach’s  $\alpha$  with larger  $\alpha$  values (greater than 0.70) indicating higher internal consistency in the measured dimension and hence greater reliability. In our study the entire variables Cronbach’s alpha (showed in Table I) are greater than 0.70. So, it is clear that the questionnaire used in this study had strong internal reliability and it could be used with confidence for the application of next statistical analysis and interpretation.

**3.2 Descriptive statistics and correlation analysis**

Table II represents descriptive statistics and correlation between each variable. If the mean scores of independent variables are observed then it is clear that Reward has higher value 4.26 then the rest of the order is as follows: Promotion and Transfer (4.03), Fair Treatment (3.93), and Training & Development and Leave & Vacation have same value (3.90). The mean score of the OCB is 4.13 means most of the employee are satisfied. Range of correlation among variables is between 0 .178 to 0 .805. Therefore, all the variables are positively related to each other (Table II).

**3.3 Regression analysis**

In order to check the impact of each independent variables on dependent variable and linear regression analysis was applied to test the hypothesis developed. Results of linear regression analysis are shown in Table III.

**3.3.1 Hypothesis 1** postulates that training and development has significant affect on OCB.

**H<sub>1</sub>: Training & Development are positively related OCB.**

21.4% variance in OCB is explained by training and development, which is evident by the value of R = 0.214, F = 5.665 at P = 0.019 explains the model’s goodness of fit. The value of t = 2.380 is the evident of significant positive relationship between independent and dependent variable. Therefore, on the basis of these results it can be inferred with confidence that H1 is accepted.

**3.3.2 Hypothesis 2** postulates that fair treatment has significant affect on OCB.

**H<sub>2</sub>: Fair Treatment and OCB are positively related to each other.**

33.6% variance in OCB is explained by fair treatment, which is evident by the value of R = 0.336, F = 15.019 at P = 0.000 explains the model’s goodness of fit. The value of t = 3.875 is the evident of significant relationship between independent and dependent variable. Therefore, on the basis of these results it can be inferred with confidence that H2 is accepted.

**3.3.3 Hypothesis 3** postulates that promotion and transfer has significant affect on OCB.

**H<sub>3</sub>: Promotion & Transfer are positively related OCB.**

38.9% variance in OCB is explained by promotion and transfer, which is evident by the value of R = 0.389, F = 21.089 at P = 0.000 explains the model’s goodness of fit. The value of t = 4.592 is the evident of significant positive relationship between independent and dependent variable. Therefore, on the basis of these results it can be inferred with confidence that H3 is accepted.

**3.3.4 Hypothesis 4** postulates that leave and vacation has significant affect on OCB.

**H<sub>4</sub>: Leave & Vacation are positively related to OCB.**

63.0% variance in OCB is explained by promotion, which is evident by the value of R = 0.630, F = 77.635 at P = 0.000 explains the model’s goodness of fit. The value of t = 8.811 is the evident of significant positive relationship between independent and dependent variable. Therefore, on the basis of these results it can be inferred with confidence that H4 is accepted.

**3.3.5 Hypothesis 5** postulates that reward has significant affect on OCB.

**H<sub>5</sub>: Reward and OCB are positively related to each other.**

54.4% variance in OCB is explained by people, which is evident by the value of R = 0.544, F = 49.528 at P = 0.000 explains the model’s goodness of fit. The value of t = 7.038 is the evident of significant positive relationship between independent and dependent variable. Therefore, on the basis of

these results we accept H5.

#### 4 Discussion

After analyzing the descriptive statistics, we found that the mean scores of the human resource management practices are greater than 3.0. It's indicating that all of the independent variables have significant relationships with OCB. The findings also prove that 'Reward' has the most significant relationship with OCB. That is, the reward system prevailing in that organization play significant role to create OCB among employees. 'Promotion and Transfer' is the second most significant practice that helps to create OCB among employees of that organization. Most of the employees are satisfied about the promotion and transfer policies of that organization. The third most influencing variable is 'Fair Treatment' which have significant relationship with OCB. The fourth most influencing variables are 'Training & Development and Leave & Vacation' which play significant role to create OCB among employees. Finally, the mean score of OCB is explained overall satisfaction of the employees toward the HRM practices of that organization.

#### 5 conclusion

Commercial banks in Bangladesh are operating their business in a highly competitive market. Especially the competition is high among the large number of privatized banks serving the society. So banks need to motivate their human resources with their limited benefit opportunities and resources to obtain maximum work effort and output. Thus sound human resource management practice could be the effective way to ensure proper utilization of human capital through intrinsic and extrinsic satisfaction and enhance organizational citizenship behavior of the people to gain sustainable competitive advantage for the survival of the banks in the long run. The bank should improve its promotion and transfer policy and equal fair treatment should be introduced. The bank also develops its training and development program through need basis and modifies the rules and regulations regarding leave and vacation. Though the result of this study clearly indicate that the practice of HRM of the particular bank have positive relationship with OCB. It could be the best way in practice for the banks to develop a sense of belongingness in the mind of all the employees working together to get the desired behavior which can not be measured by monetary terms only.

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# Structural Analysis on College Research Team's Psychological Contract

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**Abstract:** Based on self-designed questionnaire and data collected, the subjective characteristic and structure of college research team's psychological contract are analyzed. Results show that, the college research teams and members have highly similar psychological perception of mutual obligation. Structure of college research team's psychological contract is a 2 levels 6 dimensions' model. Team obligation includes goal achievement, development promotion and humanistic care. Member obligation includes task accomplishment, interpersonal cooperation and team maintenance. A significant 2-way interaction effect is also found in structure relation.

**Key words:** Chinese college; Research team; Psychological contract; Structure of psychological contract

## 1 Introduction

Psychological contract is firstly introduced by organizational behavior researcher Aigyris. Since 1980s, psychological contract is always one of the most popular research topics in organizational behavior and human resource management. Two main fields of psychological contract are most deeply studied. One is psychological contract itself, including its concept, contents, dimensions, dynamical development and violations. There are one-way/two-way relation theories for subject, 2/3/multi-dimensions for structure. And for contents of psychological contract, there are implicit agreement, suggestive commitment, expectation for duty and obligation, subjective psychological commitment, and many other different orientations. The other field is differential study based on different teams or groups, such as enterprise employee, college teachers, construction team, etc.

Based on former researchers' work on psychological contract theory and its application, there are several issues need to be solved. One is the limitation of subject, because most existing research is about enterprise employee. The other is the ignorance of organization subjective characteristic and only focuses on one-way relation. In this study, Chinese college research team is studied under a two-way relation's perception, we hope to find its unique features and figure out how to improve the formation of psychological contract in it.

## 2 Theories and Hypotheses

### 2.1 Feature of college research team's psychological contract

As a special work group, Chinese college research team is a temporary team based on college research institute, with members from different study field, intending to finish a specific research task. A college research team usually has clear goal, leader and rules, with members voluntarily and creatively cooperate with each other, and the achievement is shared by the whole team. College research team, as an unofficial temporary organization, doesn't have many restrictions to its members. In the research process, the team need all the members to do their best, while the members would want to gain certain kind of benefits. In order to maximize each side's profit, the team and its members all have their own obligations. Some of these are explicit and known as rules, others are implicit. The implicit, unspoken rules and expectations are contents of psychological contract.

Focus on two-way relation and interaction between college research team and its members, the definition of Chen and colleagues is used in this study. Chinese college research team's psychological contract is defined as the subjective understanding of team and member obligation, which is different from official rules or contract. Because the high flexibility and autonomic feature of college research team, a well defined psychological contract would help the team to improve communication and trust between its members, promote the organization as a real team and achieve a win-win situation.

### 2.2 Structure of college research team's psychological contract

Structure definition is a necessary part to study psychological contract. Based on existing research about 2 and 3 dimensions structure theory and features of Chinese college research team, this study has following hypotheses.

Firstly, college research team is highly goal orientated, so the foundation of psychological contract is team development and goal achievement. Secondly, cooperation and trust is valued higher in such a loose structure. Because research team is usually a flexible organization, with members from different majors and positions. Besides professional skills and problem-solving ability, cooperation and communication ability is also very important for a research team to function normally. Also, members have a great need for value achievement and self development. A research team is normally built with creative intelligent people, who values self development higher than people from other kind of organizations. In the incentive structure of college research team, the mental incentive factors such as social respect, value admission and achievement are more attractive to team members. Finally, based on college research team's feature(broad autonomy field, high self-esteem sensitivity, low attachment with team, etc), team and its members are equally positioned in real life relationship, the traditional advantage of organization over members is weakened. In obligation fulfillment process, team members would make subjective judgments and then adjust their behavior based on them. For college research team to form a psychological contract, the team and its members have to continuously experience a psychological interactive process of offer, counter offer, new offer and commitment.

We have two hypotheses in this study: college research team focuses on goal achievement, development promotion and interpersonal cooperation; there is a significant two-way interaction effect between team and member's obligation.

### **3 Scale Design and Analysis**

#### **3.1 Scale development**

The twin-subject feature is a key point to truly understand college research team's psychological contract. In the development process, we use deep interview and open-questionnaire to gather data from both the manager and member. Data collected these ways are then categorized, ranked by frequencies, and compared. Based on our own data and former researcher's tool, the original scale is made. After reliability, validity, and factor analysis, the final version is completed.

##### **3.1.1 Structured interview and open-questionnaire**

5 research team managers and 6 professors are invited to join the interview and talk about their understanding of college research team's psychological contract. A 10-item open-questionnaire based on literatures and experts' opinion is used on 30 college teachers to further study factors affecting psychological contract.

Results reveal that college research team's psychological contract can be divided into 2 parts: team obligation and member obligation. Team obligation focuses on goal achievement, development promotion and humanistic care. While member obligation focuses on task accomplishment, interpersonal cooperation and team maintenance.

##### **3.1.2 Item formation**

60 items are created based on interview. After revising and deleting inappropriate ones, 50 items are selected to form the original scale. Items are randomized, each facet has 25 items. Among all 50 items, 4 are reversed and should be marked accordingly. Responses are collected by a 5-point Likert scale ranged from completely unlikely to completely likely.

#### **3.2 Procedure**

36 college research teams from Hunan and Hubei are selected, including participants from literature, science and engineering. 36 Managers and 460 members are randomly selected to participate. 500 questionnaires are sent, with 473 returned and 442 been valid (88.4%). In our sample, 15.2% are professors, 72.8% are associate professors, and 13% are lecturers. About participants' degree, 31% are PhDs, 57.3% are masters.

In order to further understand the structure of the scale, we divide 442 data into 2 halves. One is then used in explorative factor analysis; the other half is for confirmative factor analysis.

### **3.3 Analysis**

#### **3.3.1 Item analysis**

Extreme group method is used to test each item's discriminability. Each participant's total score is ranked (after reversing item9, 20, 32 and 42), then the top 27% is selected as high group while the bottom 27% is low group. A t-test is carried to test the difference between 2 groups on each item. Results are reported in Table 1.

**Table 1 T-Test Between High and Low Group**

Item	<i>t</i>	<i>p</i>	Item	<i>t</i>	<i>p</i>	Item	<i>t</i>	<i>p</i>	Item	<i>t</i>	<i>p</i>	Item	<i>t</i>	<i>p</i>
1	2.385	.012	11	4.369	.000	21	5.752	.000	31	2.987	.004	41	1.657	.142
2	2.172	.032	12	4.587	.000	22	5.382	.000	32	3.467	.000	42	5.899	.000
3	2.513	.015	13	1.479	.129	23	2.379	.017	33	5.559	.000	43	6.618	.000
4	3.978	.000	14	4.172	.000	24	2.799	.005	34	3.803	.000	44	4.990	.000
5	2.976	.004	15	3.013	.003	25	3.650	.000	35	5.757	.000	45	4.507	.000
6	4.134	.000	16	3.316	.002	26	2.156	.034	36	6.221	.000	46	4.602	.000
7	4.457	.000	117	4.601	.000	27	3.389	.001	37	4.702	.000	47	4.465	.000
8	4.019	.000	18	5.814	.000	28	1.701	.101	38	5.504	.000	48	4.033	.000
9	5.775	.000	19	4.745	.000	29	.364	.717	39	6.129	.000	49	5.798	.000
10	5.911	.000	20	5.568	.000	30	1.663	.084	40	3.102	.003	50	3.022	.003

Results indicate that there are significant differences between 2 groups on all the items except 13, 28, 29, 30 and 41. These 5 are deleted; remaining 45 items are tested again.

3.3.2 Explorative factor analysis

EFA is used to test scale’s structure validity, delete unnecessary items, and improve the total psychometric quality.

Kaiser-Meyer-Olkin measure of sampling (0.824) and Bartlett’s test of sphericity(<.000) results show that data is capable for EFA. 6 Factors are extracted based on following 3 principles: eigenvalue over 1, scree plot, and each factor should have at least 3 items. 52.59% total variance could be explained by these 6 factors, see Table 2.

**Table 2 Total Variance Explained**

Factor	Eigenvalues	% of Variance	Cumulative %
1	5.547	18.301	18.263
2	2.702	8.899	28.231
3	1.786	6.021	35.234
4	1.699	5.876	42.175
5	1.435	4.503	47.562
6	1.203	3.944	52.610

After deleting low loading (lower than 0.4) and double loading items, 26 items are left to form the final version. All 26 items and their component matrix are showed in Table 3.

**Table 3 Component Matrix**

		1	2	3	4	5	6
V11	Necessary research conditions	.726					
V45	Reasonable amount of resources	.667					
V37	Advanced and scientific regulations	.647					
V16	In time positive regard	.508					
V27	Clear assignment and obligation	.520					
V42	Chance for further studying		.655				
V39	Focus on member’s development		.627				
V41	Assistance in project application		.587				
V32	Just and rational ownership assignment		.562				
V40	Regular academic communication conference		.549				
V14	Respect other members			.636			
V12	Consider member’s opinion when making big decision			.612			
V43	Trust other team members			.607			

V23	Caring about teammate's life			.561			
V12	Fair and just environment			.534			
V9	Ever growing skill and ability				.690		
V3	Finish research task successfully and timely				.576		
V6	Possibility to fully perform academic specialty				.518		
V10	Maintain a harmony relationship between members					.405	
V33	Respect academic disagreement					.609	
V29	Teamwork					.656	
V30	Greater good					.601	
V49	Defend team image and interest						.795
V37	Follow team regulation						.748
V22	Willing to give advice for team development						.455
V4	Willing to participate in communication conference						.448

Analysis reveals 2 facets: team obligation and member obligation. Each factor is named according to their items and content. Factor 1 is Goal Achievement, which is mainly about software and hardware condition of the college; Factor 2 is Development Promotion; Factor 3 is Humanistic Care; Factor 4 is Task Accomplishment; Factor 5 is Interpersonal Cooperation; Factor 6 is Team Maintenance.

### 3.3.3 Reliability analysis

Cronbach's Alpha and split-half reliability is used as reliability index. After removing Factor 5, Cronbach's Alpha is 0.716, split-half is 0.911. All six dimensions' reliability ranges from 0.616-0.763( $\alpha$ ) and 0.614-0.735(split-half) respectively, indicate high consistency and psychometric quality.

**Table 4 Reliability Analysis**

Factor	Cronbach's Alpha	Split-half reliability
Factor 1 Goal Achievement	.758	.729
Factor 2 Development Promotion	.702	.721
Factor 3 Humanistic Care	.687	.608
Factor 4 Task Accomplishment	.621	.588
Factor 5 Interpersonal Cooperation	.588	.544
Factor 6 Team Maintenance	.541	.637
Total	.719	.909

### 3.3.4 Confirmative Factor Analysis

CFA is used to test the fitness between model and actual data. As introduced in 2.2, 221 participants' data is used in this analysis using AMOS 7.0. Results are showed in Table 5.

**Table 5 Confirmative Factor Analysis Results**

$\chi^2$	df	$\chi^2/df$	RMSEA	GFI	AGFI	CFI	NFI	IFI	TLI
247.251	81	2.524	0.037	0.8765	0.869	0.868	0.794	0.875	0.862

Fitness index ( $\chi^2/df$ ) is 2.013; GFI, AGFI, CFI, NFI, IFI, TLI are all above 0.80; RMSEA is 0.044; all indexes indicate a very good model fitness. Final version of college research team's psychological contract scale has satisfactory structure validity.

## 4 Conclusions

Subjective characteristic and structure feature of college research team's psychological contract are analyzed and tested. The scale we designed shows great psychometric quality in data analysis, is qualified for research purpose and requirement. College research team's psychological contract is significantly dual-subject; similar patterns exist in team and member's psychological perception of mutual obligation. Structure of college research team's psychological contract is a 2 levels 6 dimensions' model. Team obligation includes goal achievement, development promotion and humanistic care. Member obligation includes task accomplishment, interpersonal cooperation and team maintenance. A significant interaction effect between different levels is also found.



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## Study on the Institutional Innovation of Internal Control in University Accounting under No-cash Reimbursement

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**Abstract:** Based on the analysis of no-cash reimbursement's influence on university financial process, this paper points out that no-cash reimbursement puts forward new requirements for financial internal control system in university accounting, the requirements including to strengthen the information control of bank card, to strengthen the accounting business audit control and the safety control of system, and to improve the accountant's quality, etc. Finally, the paper gives suggestions on financial internal control innovation of university accounting under no-cash reimbursement, including creating people-oriented internal control environment, comprehensively assessing the financial risks, sounding the internal control system and making the financial process standardization, strengthening the internal and external information exchange, and establishing internal and external coordination supervision mechanism.

**Key words:** No-cash reimbursement; University accounting; Financial internal control system; Institutional innovation

### 1 Introduction

In early 1992, the COSO (The Committee of Sponsoring Organizations of The National Commission of Fraudulent Financial Reporting) had already issued the famous "internal control---integrated framework", the concept of internal control was first put forward and divided into five elements which were internal control environment, risk assessment, accounting process control, exchange of financial information, establishing coordination supervision mechanism.

Generally, no cash reimbursement can be regarded as one of the important aspects of the accounting information system.

Zhou Ping(2007) discussed the relationship between internal control and accounting information quality, considering that there is a close logical relationship between them<sup>[1]</sup>. Sun Pengyun(2009) studied the demand motivation of enterprises' internal control environment<sup>[2]</sup>. Wang Suping(2010) found out the path to implement the internal control of accounting information system through analyzing the features the system under network environment<sup>[3]</sup>. Andreas I. Nicolaou (2000) made an empirical study on accounting information system, and it indicated that the fit between the accounting system design and the contingency factors resulted in a more successful system. The study addresses an important area in accounting systems research that directly relates to the decision facilitation and control objectives of accounting information<sup>[4]</sup>. Jap Efendi, Elizabeth V. Mulig and Murphy Smith's(2006) study shows that Information technology plays a critical role in modern business, especially regarding the accounting function. Thus, one might expect that information technology and accounting systems would be a major component of accounting research. They have examined the proportion of technology and systems articles in seven top-ranked accounting journals<sup>[5]</sup>.

Although there are plenty of researches on the internal control of accounting, there is little about the internal control in university accounting under no-cash reimbursement which now is the new trend of university financial development.

No-cash reimbursement is a new way for accounting processing. When a customer applies for reimbursement business, the payment will be finished by no-cash payment system. In other words, since the financial system of the accounting department is connected with bank's system by network, then the reimbursement expense can be transferred directly to the customer's bank card or savings account instead of by cash payment. Considering the characteristics of university's accounting under no-cash reimbursement, this paper analyzes the deficiencies of traditional internal control system, and puts forward the measures to innovate the internal control system under no-cash reimbursement.

### 2 No-Cash Reimbursement and Its Influence on the University Accounting Process

Along with the trend that the university accounting has gradually adopted the no-cash reimbursement mode, the accounting operation process and financial management have been changed subsequently. And this affects a lot on the financial internal control system of university accounting.

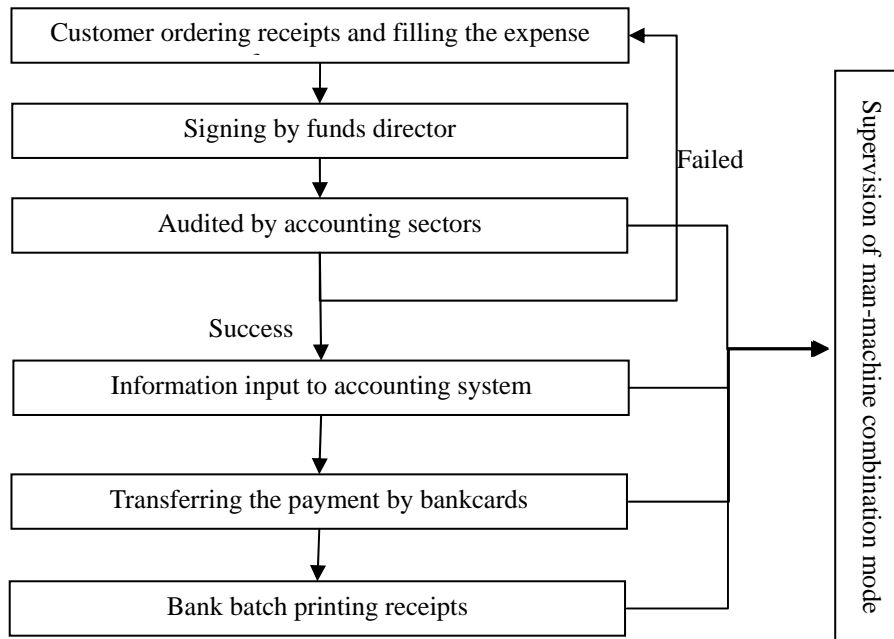
**2.1 Changes in the control over cash flow**

From the view of cash flow control, university accounting control on cash payment gradually becomes weaker, while the control on electronic means of payment is emphasized. On one hand, there is no need for university financial department to make settlement by cash or by check under no-cash reimbursement mode, and then the financial department gradually achieves the “zero cash stock”. Therefore, cash control will be gradually weakened, and the work on cash safekeeping and bill management associated with the currency payment is reduced accordingly. On the other hand, since the university financial department directly transfers the payment by no-cash reimbursement system, the control on electronic payment means should be strengthened. The control includes the developing and maintenance of the electronic payment system, authorizing the accountant to implement payment, and so on.

**2.2 Changes in supervision mode**

From the view of supervision on financial department, the no-cash reimbursement mode makes the supervision more rigid because it transfers the mode from traditional "person to person" to "man-machine combination". As we know, the traditional inspecting subject and object of financial internal control both are persons, and this kind of supervision is flexible in some degree. However, the settlement and payment are finished mainly by the help of computer system, network and other hardware equipment and financial software under no-cash reimbursement. On one hand, the specially designed financial software can play a role in the supervision of accounting operation process. On the other hand, the supervision objects are extended from person to computer system, network, hardware equipments and financial software, which make the inspection more rigid.

The new financial process and supervision mode under no-cash reimbursement can be described by figure1.



**Figure 1 Financial Process and Supervision under No-Cash Reimbursement**

**2.3 Changes in professional requirements for the accountants**

From the accountant’s quality view, they should have high quality associated with the no-cash reimbursement. On one hand, besides the professional ability as the traditional accounting work requires, under no-cash reimbursement, the accountant is needed to master the technique of electronic payment expertly, to communicate promptly with the bank and other sectors of financial department, and to conduct regular reconciliation work, etc. On the other hand, due to the particularity of no-cash reimbursement, if one part of the accounting process is not prudent, it is easy to lead to embezzlement and corruption, which requires the accountant with high occupation morality and legal consciousness.

### **3 The Requirement to Innovate Financial Internal Control System of University Accounting under No-cash Reimbursement**

#### **3.1 Requirement to strengthen the control of primary information on bank card**

As a carrier of electronic payment, bank card plays an important role in no-cash reimbursement. So there is no doubt to strengthen the control of primary information on bank card. The control includes the accuracy and security on the primary information of bank card.

As an important carrier of electronic settlement, bank card's information accuracy directly relates to whether the reimbursement process can be smoothly finished under no-cash reimbursement. The role of bank card is different from the traditional cash payment or cheque clearing mode. Once there is an error in the accounting process will directly impact the efficiency of financial department, and it would also threaten the accountant's key interests. Therefore, it is necessary to carefully collect cardholder's information, and strictly limit to issue the bank card. On one hand, in order to ensure the accuracy of the primary information from the source, the accountants should not only check the cardholder's name and his ID number, but also verify the matching of his name with his ID card number and bank card number. On the other hand, there should be someone specially assigned to maintain the information of bank card in daily work to assure that the information is accuracy when somebody applies for reimbursement. The information maintenance includes renewing cardholder's information, changing the card number, and so on.

As to the control on the security of bank card's primary information, the accountant must strictly keep the customer's information as secret and should not reveal it outward at will. One important work is to prevent some illegal members to exploiting the information for cheating, and to prevent the internal accountant's illegal infringement. This is helpful to reduce the financial risks. Besides, the financial department should strengthen the connection and communication with the bank. The financial department not only need to ensure the interface between bank payment and reconciliation keeping clear in order to smoothly finish daily settlement and reconciliation work, but also need to negotiate with the handling bank in advance and to solve the problems such as withdrawing cash on strange land, charging service fee when transferring bank card, etc. This would be helpful to avoid unnecessary conflict afterward.<sup>[6]</sup>

#### **3.2 Requirement to strengthen the control of accounting audit**

The internal audit is an important part of financial internal control system. The audit to each operating link of the accounting process is especially important under no-cash reimbursement mode. As no matter for the individual business or group business, the settlement and payment are finished by electronic money directly instead of by cash under no-cash reimbursement, without the need for the on-site inventory notes. Therefore, in order to ensure the reimbursement payment accurately entering the designated payee's bank account, it is necessary to strengthen the audit for each business link in the no-cash reimbursement. This would be helpful to make the reimbursement business completed effectively, and to prevent the accountant using his authority for corruption and embezzlement of public funds.

On reimbursement business audit, no-cash reimbursement requests to strengthen accounting audit, review of accounting documents, operation information check before payment, and timely account reconciliation. Firstly, for every reimbursement business, the accounting audit personnel need to audit the legitimacy of all the original accounting documents, the rationality of reimbursement channels and the accuracy of reimbursement amount seriously, and to input the payee's information accurately or to correctly extract the payee's information from the financial system. Secondly, the accounting documents review has been changed from the traditional checking after the event to spot checking under no-cash reimbursement mode, i.e. the accounting documents will be passed directly to the reviewer after the audit's check and attn's confirmation, and then the reviewer makes on-site check and signs or seals on the documents if there is no problem. Thirdly, the cashier must make further check on the payee's name and bank account after the accounting documents has been delivered to him, then executes the payment after verification. Finally, the cashier must print the daily deposit account, timely accomplish reconciliation work with the bank, prepare the bank balance reconciliation statement and find the cause of pending items to ensure each settlement business being finished accurately

#### **3.3 Requirement for the system and its safety control**

Compared with traditional reimbursement mode, no-cash reimbursement is more dependent on computer network, which consists of three systems as bank system, financial system and no-cash reimbursement system. Failure in any part will cause the system unable to run. So this proposes new

requirement for the system and its safety control. The requirement for system performance can be for both hardware and software.

From the hardware point of view, no-cash reimbursement mode requires that the accounts, information storage and file transfer should be stored in the computer in the form of electronic file, and be transmitted through the network. Thus, this raises high requirement for system hardware in bank and university financial department. For example, the information output devices, information receiving devices and computer system must be equipped with the requirement of no-cash reimbursement system. They should be compatible, harmonious and consistent and able to create an overall effect. In addition, the electromagnetic storage of accounting information has raised new requirement to the application personnel and the maintenance personnel, because huge amount of accounting information are stored on magnetic media and can be easily removed or tampered without traces under no-cash reimbursement. Therefore, the application personnel must strictly abide by the rules and regulations to avoid unauthorized and illegal behavior. While the system maintenance personnel must timely make fault detection and have the ability for system recovery if the system is in trouble, and ensure the normal operation of the system.

From the software point of view, since no-cash reimbursement system makes the financial data to flow from closed processing platform into the network, and this makes the reimbursement system operating in the open network, therefore the financial system and accounting information security has been faced hitherto unknown challenge. This puts forward high requirement for software system. In the developing process of financial software, the software developer needs to consider the problem in all its aspects, to prevent the system setting not matching with actual situation, and to avoid system vulnerabilities. Once some malefactors find the loopholes, they may use high-tech means to invade the system, and would bring great losses for the university and bank.

### **3.4 Requirements to improve the accountant's quality**

Since no-cash reimbursement system changes the traditional accounting process, it requires the accountant to complete the settlement and payment work in electronic money online. Therefore, financial personnel must be able to adapt to the new working environment, and has the ability to solve new problems appeared in the accounting process. This puts forward new requirement for improving accounting personnel's quality.

Firstly, the financial personnel must have the ability to do the accounting work on network and is capable of electronic settlement task under no-cash reimbursement. This requires the financial personnel has relevant professional knowledge and computer skills, and is familiar with no-cash reimbursement process. Therefore, the financial department should train the financial personnel to help them to get the knowledge on no-cash reimbursement and financial regulations, and to improve their financial professional skills and operational level.

Secondly, the financial personnel must be capable to resolve new problems encountered under no-cash reimbursement. For example, the financial personnel can timely discover the problems, and promptly notify the maintenance personnel to conduct inspection and troubleshoot system fault in the event of a fault. Another example, in view of the particularity of information storage under no-cash reimbursement, the financial personnel must have the ability to maintain system security, to preserve the existing data, and to prevent the emergence of greater error in case of system failure.

Finally, no-cash reimbursement mode needs the financial personnel has good occupation ethics and moral cultivation to avoid financial crime. Under no-cash reimbursement mode, financial data is stored on magnetic media, and no trace is left when the data is changed. Thence, this may easily leads to indiscriminate use of privileges, embezzlement and financial crime. This requires the financial personnel have good occupation morality, can resist the temptation and legitimately perform the accounting responsibility.

## **4 Suggestion on the Institutional Innovation of Internal Control in University Accounting under No-cash Reimbursement**

From the perspective of the key elements of internal control, the university's financial department can make some innovation from five interrelated aspects such as internal control environment, risk assessment, accounting process control, exchange of financial information, establishing coordination supervision mechanism. The financial department needs to establish long-term control mechanism and standard, to control and manage the process effectively, and to ensure the implementation of the standardization of basic accounting work.<sup>[7]</sup>

#### **4.1 Creating people-oriented internal control environment**

A good internal control environment play a key role in shaping organizational culture, and it influences personnel control's consciousness and lays organizational styles on internal accounting control. A good environment is the foundation and the engine of financial internal control frame. Along with the change of university financial reimbursement mode, it is necessary to create appropriate financial internal control environment under no-cash reimbursement in order to follow this new trend. We will analyze from the following three aspects.

Firstly, it is urgently important to improve the financial personnel's professional ability, so that they can fit the new working environment of no-cash reimbursement. Since no-cash reimbursement mode has changed the traditional accounting operation process, this requires the financial personnel have the ability of electronic money payment. So it is necessary to train the accounting personnel, to help them become familiar with operation procedures and the new environment under no-cash reimbursement as soon as possible, to deepen their understanding on the new accounting process and learn to solve the new problems.

Secondly, it is important to strengthen organization construction, to make appropriate adjustment for organization setting, and to intensify the mutual restraint on the division of sector function. Under no-cash reimbursement, accountant and cashier are more strongly associated with together, in many cases, they work at the same office, but this is not conducive to the independence of the powers and responsibilities of different accounting sectors. In view of this phenomenon, when setting financial sectors, the university financial department should obey the duties incompatible principle, reasonably set accounting sectors including accounting sector, audit sector, cashier sector, and achieve all the sectors separation and keep the independence of accounting and cashier sectors. In accordance with the accounting positions incompatible and duties separation principle, the financial department should set the positions such as cashier, audit, check, account management, system maintenance, file management, bill management, salary management and so on. And each position has clear post duty and responsibility.<sup>[8]</sup>

Thirdly, the financial staff's occupation morality education should be strengthened in order to promote the healthy development of university's financial affairs under no-cash reimbursement. Based on the particularity of electronic clearing operations under no-cash reimbursement, the financial personnel is easier to modify financial information or even operate illegally. Therefore, it is very important to improve financial personnel's occupation morality and to enhance his legal consciousness.

#### **4.2 Comprehensively assessing the financial risk**

Because of the financial activity change from traditional mode to no-cash reimbursement mode, many new risks appear. Compared with the traditional mode, the financial risk highlights in the technical risk and operational risk coming from new operational procedures under no-cash reimbursement system. Therefore, in order to reduce the risk of accounting work, it is necessary to bring these new risk factors into consideration, comprehensively and reasonably to assess the financial risk, and to take the combined measures of self-inspection and error correction.

The technical risk mainly comes from the hardware and software of the system under no-cash reimbursement. On hardware, no-cash reimbursement system consists of three parts of bank port, financial system and no-cash reimbursement process. This puts forward higher requirement for the performance of computers and other equipments. Once one part is not functioning properly will make the entire system cannot to operate. On software, since no-cash reimbursement system is under the open network, the financial system can be often infected by virus or attacked by hacker.

The operational risk is mainly due to financial personnel's lack on technical knowledge and skills or improper operation. For example, if the financial personnel does not install antivirus software, not regularly updated virus database, and add hardware or install application software at discretion, this would causes the system to be infected by virus or attacked by hacker, lead to the password disclosure or being stolen, eventually result to serious losses for the university and the customers.

#### **4.3 Sounding the internal control system and making the financial process standardization**

The university financial department should establish and improve the internal control system after it utilizes no-cash reimbursement, for example, to set up the management regulations such as "Accounting processes and practices under no-cash reimbursement", and "The division of posts, its responsibilities and authority under no-cash reimbursement". By improving the internal control system, strictly controlling the financial activities and strengthening self restraint mechanism, this will be helpful to reduce the financial discipline and to ensure orderly operation of the university's financial business.

After a detailed decomposition to the process of no-cash reimbursement, and according to the

mutual relationship between each link of the processes, the "Accounting processes and practices under no-cash reimbursement" gives detailed operating rules, which makes the financial activity standardization, and helps the financial personnel quickly to get familiar with no-cash reimbursement process and to avoid mistakes by improper operation.

"The division of posts, its responsibilities and authority under no-cash reimbursement" includes division of labor, the authorized examination and approval system, internal control system for cash and bank account, the implementation of special management for the bill, etc. And this provision should pay special attention to authorized examination and approval system, because only when all accounting personnel engage in the accounting business activities within the scope of authorization, can the occurrence of corruption be effectively prevented. It is required to set the appropriate permissions for cashier, audit, review public inquiries and other users in order to limit their right to use the financial system module. The chief accounting officer is responsible for the system operation permission setting. The operation authority is set according to the post's responsibilities and may not be changed at discretion.

Since the accounting process has been changed under no-cash reimbursement, it is necessary to establish strict internal control system to standardize the accounting procedures and to constrain the financial behavior.

#### **4.4 Strengthening the internal and external exchange of financial information**

Since the internal control goes together with the management process, which is a dynamic process of moving in circles with ongoing problem-discovering and problem-solving, therefore, under the new mode of no-cash reimbursement, whether the internal and external information can be captured and be processed in time, and be smoothly transferred among different sectors of the financial department even outside the department on different levels, and can be well understood and be used will determine the realization degree of the organization's goal. And this is also the necessary condition for the organization and its employees to perform their duties.

On internal communication, in view of the features of no-cash reimbursement, university financial department may take training, lectures and other internal communication forms to promote the financial personnel to better understand the operation processes and new accounting business. On external communications, the financial department can get more feedback information through information communication and the exchange among the different departments in the university. And this is helpful to find the problems in the system operation. In view of its particularity, since no-cash reimbursement system consists of three parts of bank port, financial system and cash reimbursement system, therefore, the university financial department should pay special attention to strengthen the information exchange with nominated bank. Timely transfer of internal and external information can help financial personnel to find out the problems and inadequacy of no-cash reimbursement system.

#### **4.5 Establishing internal and external coordination supervision mechanism**

Internal control emphasizes on process management. Under no-cash reimbursement mode, financial activities participants not only include the university financial department, but also include the banks, customers and system developers and so on. And the financial supervision mode changes from the traditional 'people to people' supervision into 'human-machine' supervision, which requires to establish the cooperative supervision system combined with internal supervision and external supervision.

On one hand, the financial department can make real-time control and supervision for the accountant's operation by properly designed financial software. For example, the financial department can set reimbursement amount restriction. Once the financial personnel inputs data and submits reimbursement application more than the limit amount, the system will send out warning. Another example, the financial department can strictly supervise the reimbursement process, to prevent the skip or leakage of necessary operation process by controlling the system process's operation sequence. On the other hand, the external auditing department or administrative department of the university should check the basic accounting work regularly, assess accounting work quality and establish a perfect financial discipline and the incentive system in order to effectively prevent the moral risk under no-cash reimbursement.

## **5 Conclusion**

Computer and internet technology has changed the financial process, whereby no-cash reimbursement mode has appeared subsequently. No-cash reimbursement has changed the traditional

financial process, and it will result in the change of traditional financial internal control system.

Taking university accounting as an example, this paper gives some suggestions for financial internal control system innovation under no-cash reimbursement in current technology conditions, which would provide reference for the financial department in university. However, since computer and internet technology is in continuous development, it will deeply influence the accounting activities, so that no-cash reimbursement mode will also be changed subsequently. Then, the innovation of financial internal control system will be a lasting process. Therefore, in the era of rapid development of computer and internet technology, the study on the innovation of financial internal control system will be an eternal topic.

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## Analysis of Influencing Factors on Improving the Effect of College Graduates Village Officials Project

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**Abstract:** As a strategic measure proposed by the Party Central Committee in the new historical situation, college graduates village officials project has an important influence on alleviating the employment pressure of college students and promoting the building of new socialist countryside. Taking the effect of college graduates village officials project as the focus, applying interviews and questionnaire to evaluate and analyze the influential factors of the engineer, we believe that village officials familiarity to rural work and their practical ability are closely related to the effect of college graduates village officials project, and finally, we put forward response measures to the restricting factors which affect the effect of college graduates village officials project.

**Key words:** College graduates village officials; Questionnaire survey ; Effect evaluation; Influential factors

### 1 Introduction

The Communist Party Central Committee's Organization Department has promulgated a series of policies of the college graduates village officials Project since 1995 in order to promote the construction of new socialist countryside. Historically, the strategic value of the college graduates village officials exists in two points—one is to solve the problem of college graduates' employment, another is to transport talents to the construction of new socialist countryside (Wang Tianmin, 2007). Meanwhile, with the implementation of the project, the advanced deeds of the college graduates village officials had been diffused rapidly around the country from part to whole and have drawn more attention of the society. The effect of this project have gained social recognition gradually. In order to analyze the influencing factors of these effects, this paper made expert interviews and questionnaire survey on Henan Province and Shanxi Province of China. Besides, questionnaire on typical nationwide areas where the project of the college graduates village officials implemented and case analysis had been used in this paper. The questionnaires were sent to the college graduates village officials, the leaders of the rural basic-level organizations and the local villagers. Among them, 350 questionnaires were issued to the college graduates village officials, from which 332 questionnaires were returned and 306 were valid. 210 questionnaires were sent to the leaders of the rural basic-level organizations, from which 198 questionnaires were returned and 195 were valid. 500 questionnaires were sent to the local villagers, from which 460 questionnaires were returned and 415 were valid.

### 2 Effect Evaluation on the College Graduates Village Officials Project

The college graduates village officials, who are the educated youth having finished the higher education, can take advantages of their knowledge, technique and networking resources to serve the rural areas well. Not only do they pass the scientific agriculture technique, advanced management measures, effective information of being rich to farmers, they also influence and improve farmers' living habits, ways of thinking, etc., which promotes both the material civilization and the spiritual civilization development in the rural areas.

#### 2.1 College graduates village officials' advantage

As shown in the investigation's findings, there are more than 90.0% of villagers holding the point that the college graduates village officials are full of knowledge and their learning abilities are high. In addition, 87.0% of villagers think that the college graduates' approaches to the information are ample and more than 60.0% of them consider that the college graduates village officials have great passion and vigor. Above all, villagers think highly of the college graduates village officials. A detailed result is shown in Figure 1.

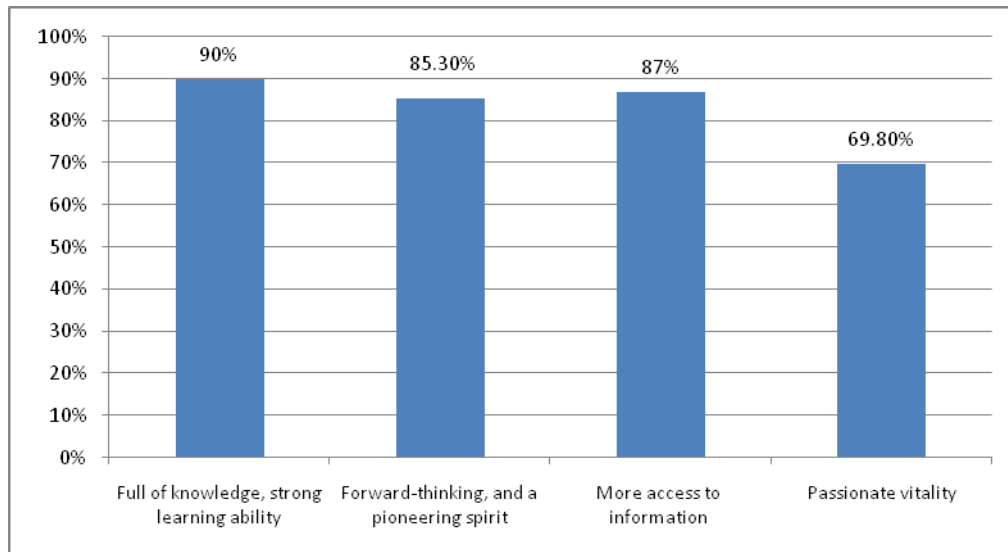


Figure 1 College Graduates Village Officials' Advantage Map

**2.2 College graduates village officials' evaluation of its own effect**

As highly educated youth the college graduated village officials take advantage of their knowledge, skills and the network of resources to serve the countryside. They can not only transfer to the farmers agricultural science and technology, advanced methods of management and effective information to become rich, but also objectively influence and improve the farmers habits of life and the way of thinking and thus, accelerate the development of both materials and spiritual civilization in the rural areas. The research has discovered that 79% of the college graduates village officials frankly say that they participate the management of the affairs of the villagers and improve efficiency, 60.3% of them say they have spread new agricultural technology and provide information to become rich. 59.3% think they have animated the farmers cultural life.66.7% are sure that they have transformed the farmers concepts.66.5% of them think that they've improved the natural environment and strengthened securities management. A specific evaluation is shown an in Figure 2.

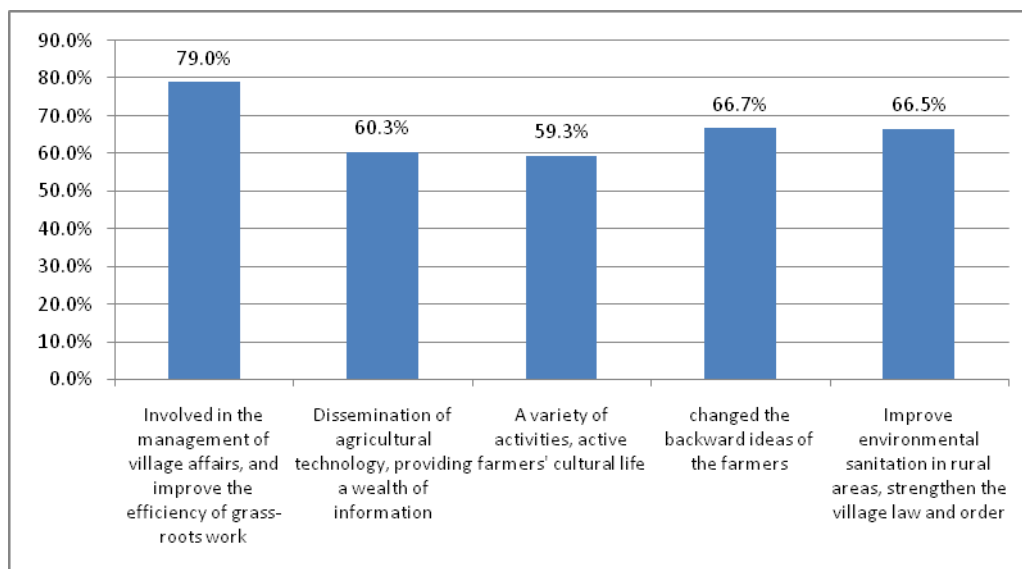
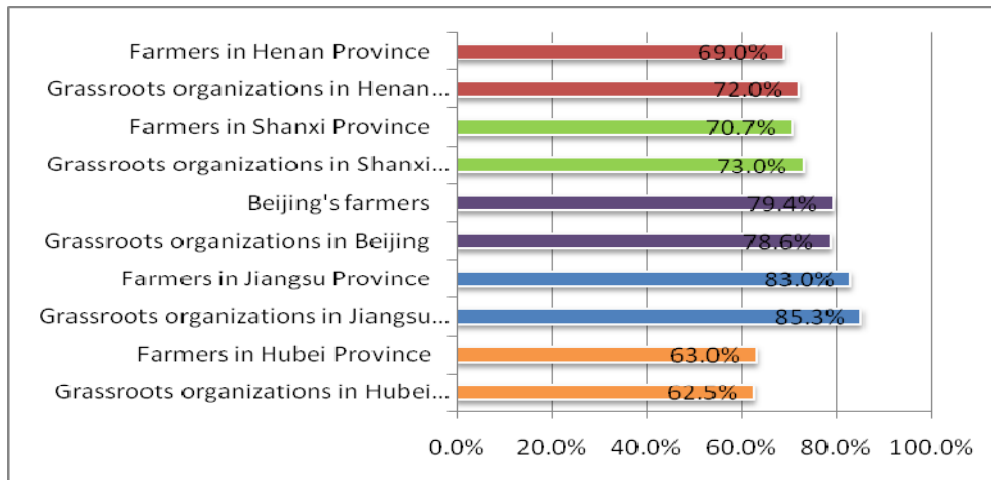


Figure 2 College Graduates Village Officials' Evaluation of Its Own Effect

**2.3 Villagers and basic-level organizations' evaluation of the college graduates village officials**

In order to truly reflect the effect of the status quo of the college graduated village officials from various angles, the report made a separate investigation on local villagers and primary organizations. When asked "What do you think of the role that the college graduated village officials have played in

the construction of new countryside”, farmers and primary organization from 5 provinces all hold positive attitude and their evaluation is shown in Figure 3.



**Figure 3 Villagers and Basic-level Organizations of the Five Provinces' Evaluation of the College Graduates Village Officials**

It can be seen from the data in Figure 3, that local villagers and primary organizations hold a pretty high acceptable level. Analyzing the data, it's not difficult to find that the recognition levels of villagers and organization for the college graduated village officials from the same province are about the same whereas there exist some differences between people from different provinces. Those from Jiangsu Province of China hold the highest level of recognition while Hubei Province of China the lowest with Beijing, Henan and Shanxi following Jiangsu Province of China. Coincidentally Jiangsu of China took the lead in the whole country to advertise job offers to the college graduated village officials throughout the country to serve as primary officials in the countryside in 1995, while Hubei province of China started the project in 2008.

Based on the consideration of the starting time of the project, we made an analysis on the length of time when the college graduated village officials, work in the country and the effect of the project. The beta value of the correlation coefficient is 0.414. The two show a strong positive correlation, indicating that the length of time working in the country effect the efficiency of the project of the college graduated village officials. As a special social group, the transform of their identity must face the process of the socialization of roles. The realization of self-identity recognition and the shortening of psychology distance with the rural masses require a certain period of times, during which the degree that the college graduated village officials realized their value and their working ability will both be promoted. Therefore, with the popularization of the project on a large scale throughout the country and constantly improve, the project will play a greater effect and encourage the construction of socialist new countryside.

### **3 Analysis of Influencing Factors on the Effect of College Graduates Village Officials Project**

With the implement of the college graduates village officials project, a wide range of college graduates village officials have been gradually admitted. However, effect of the college graduates village officials project and the role it plays are affected by many factors.

#### **3.1 Analysis of the subjective factors on the effect of college graduates village officials project**

The survey suggests that 74.1% of the university students as village officials are under the age of 26, 49% of which are graduates. And only 32.5% of the undergraduates have been working in the village before they do their job as village officials. They just graduate, or have one year working experience, or 2-3 years. They are incapable of adapting to the rural environment, neither are they familiar with the work. However, the rural environment and the related work are trivial, complex, which makes it difficult to those village officials who are not familiar with the rural environment, and those who lack the rural working experience of rural work experience. Therefore the graduate fails to realize the potentiality as village officials. In addition, 38.3% of the college graduates village officials believe that many problems

occur in their practical works because of the failure of making fully advantage of their professional knowledge and skills, the lack of social experiences, and the inharmonious relation between their skills and the economic development, resulting in their work not be effectively carried out.

### 3.2 Analysis of the objective factors on the effect of college graduates village officials project

According to survey, 76.5% of village officials think that the most obvious obstacle is the obscurity of their legislative status. Besides, their rights and obligations are not clear. 67.9% of the people think that the village appraisal and promotion mechanism is not perfect, and their future development is uncertain. 46.9% of village officials feel the pressure deriving from the low wages and the lack of security. At present, the recognition of the identity as village officials' identity of the village officials comes from two sources. One is them and the other is the society. The social recognition is related with their social position. Sometimes the psychological problems occur in their minds in terms of the legislative status and recognition, which results in the difficulties in their practical work. At the same time, as a new phenomenon, there are inevitably some defects, such as policy formulation and evaluation of supervision. The fact that welfare and security may not be implemented easily leads to the village officials in the psychological form rooted psychological development of the conflict and the future; they need to be continuously improved and optimized. Therefore, accurate recognition of identity, stable welfare system and complete working system is to make students village officials to be maintained the necessary way, and it needs for continuous improvement and optimization.

Other factors are as follows: 52.9% of the college graduates village officials think that the rural environment is complex and tedious; 34.6% of the college graduates village officials complain about the lack of human, material and financial resources; 33.3% of the college graduates village officials think that the working environment is disappointed and the office instruments are deficient.

Thus, in order to realize their potentialities, not only that their abilities should be developed, but also the working conditions should be improved. As shown in Figure 4.

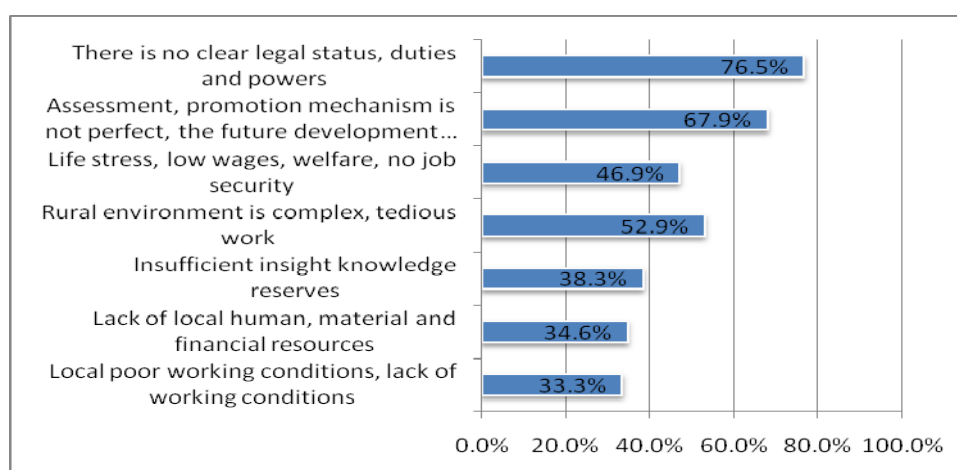


Figure 4 Factors that Affect College Graduates Village Officials' to Play a Role

## 4 The Improvement Measures of the College Graduates Village Officials Project

In this paper, we can conclude that both village officials familiarity to the rural work and their practical ability affect the project effect through the in-depth analysis of those influential factors. (Just as shown in Table 1 and Table 2, the relationship between both the null hypothesis is  $0.000 < 0.05$ , and the relationship strength respectively is 0.614 and 0.879). Village officials generally just graduated from college and didn't know much about the rural working conditions. Therefore, it is necessary for village officials to receive training in agriculture-related policies, knowledge, psychological and work experience. Specifically, one is to establish a platform for village officials to communicate and learn mutually, and another is to set a "one-to-one" supporting system, namely a cadre having grass-roots work experience helps a village official and teaches them working experience, assists them to analyze and solve the problems faced in the practical work. Accordingly, strengthening the "village official" work skills training, enriching their rural work experience, and improving their working capacity play a vital role in the new rural construction process. At the same time, because the village officials practical ability affect the project effect to a certain extent, so when recruiting village officials, local government

should highlight their practical ability, increase the threshold of students competition, enhance transparency in the selection process, and make the selection process and results known to the public (Lv Hongliang, Lv Shuliang, 2009), which will help to establish an excellent village official team.

**Table 1 Correlation Analysis of College Graduates Village Officials Familiar with the Rural Work and Effect of College Graduates Village Officials Project (N=564)**

Correlation analysis of college graduates village officials familiar with the rural work and effect of college graduates village officials project	Type of measurement	Value
The strength of relationship	Eta	0.614
Significant level of inspection	Variance test	0.000 (P※)

**Table 2 Correlation Analysis of College Graduates Village Officials Ability to Practice and Effect of College Graduates Village Officials Project During the School (N=564)**

Correlation analysis of college graduates village officials ability to practice and effect of college graduates village officials project during the school	Type of measurement	Value
The strength of relationship	Eta	0.879
Significant level of inspection	Variance test	0.000 (P※)

(P※ is the probability for the null hypothesis (i.e., the relation between them is not the establishment of probability) ,similarly hereinafter . In this paper, we put saliency as 0.05, we consider the relationship between the two factor is not established as long as the null hypothesis probability less than 0.05, similarly hereinafter.)

In addition, through the investigation, this paper finds that village officials' level of education and the effect of college graduates village officials project show weak positive correlation, the correlation coefficient ETA is 0.273. However, there is a strong positive correlation between whether village officials apply their major to the rural counterparts or local government whether consider the college students work professional background match their demands and the effect of college graduates village officials project , the correlation coefficients are 0.575 and 0.693.

## 5 Conclusions

To implement the "one college official for one village" work plan and make the full show of effect of college graduates village officials project , on one hand, we must formulate scientific recruit training system, increase the rural working familiarity and practical ability and take the professional counterparts problems into consideration, so that those selected village officials can apply what they have learned to serve the new rural construction and development. On the other hand, the project should follow the "distribution according to the need" principle, that is to say, when university cultivate and transfer talents to rural and the local government select village officials ,the demand for local talents situation need to be considered to make every man do his best according to his lights.

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## Reflection on the Roles of Language Teachers in Computer-Assisted Class

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**Abstract:** Different from the traditional ones, the roles language teachers are taking in the context of computer-assisted class deserve much more attention. This paper at first explores the characteristics of computer-assisted class and the new relationship between the teacher and students in the new pattern is also discussed. And then it analyzes from four dimensions the various roles language teachers play, on which occupational and interpersonal roles are put much focus. The paper at last comes to the conclusion that study on the roles of language teachers provides valuable insights into language teaching, making the computer-assisted language teaching more effective and creative as well.

**Key Words:** Computer-assisted classroom; Teachers' roles; Occupational; Interpersonal

### 1 Introduction

In everyday life, computer has now become quite available in many aspects such as financial affair, personal communication, and health service as well. In 1950's computer significantly came into the area of language learning and teaching, which has been developing with the researches on the language acquisition. Since then CALL (Computer-Assisted Language Learning) has experienced its important phases which fall into 3 categories: behavioristic, communicative and integrative CALL.

It was not until 1980's, however, that computer-assisted language instruction begun to draw people's attention in China. And after that this topic gradually became one of the research issues in the field of foreign language learning and teaching. At the end of last century, CALL has widespread so quickly in the country that nearly 10% of the college students learn foreign languages, more or less, on computer either in schools or at home. Besides, more and more language teachers have begun to think more about the implications of computer technology for their language teaching. In the 21<sup>st</sup> century computer-assisted instruction is expected to lead the trend of foreign language learning and teaching, which is characterized by the co-operation on the parts of both teachers and students. And when role relationship between teachers and students becomes a central issue in the researches of language classroom, the new roles of language teachers in the new pattern have been drawn much more attention.

What is discussed in this paper is the roles that language teachers play in the context of computer-assisted class. To begin with the study, the characteristics of computer-assisted class, are analyzed. By comparison, the relationship between teachers and students in the new pattern is also discussed. To explore the transform of teachers' roles from the traditional ones to new ones, the discussion of language teachers' roles at different stage of class and in different classroom teaching is developed from four dimensions, on which occupational and interpersonal roles are placed much emphasis. Lastly conclusion is drawn.

### 2 Literature Review

In the traditional model of language teaching and learning, teacher have always acted as the controller of the class, while the students are the passive receivers. And such case has no exception in Chinese classroom. However, in a desired classroom setting, a qualified teacher and successful students are expected to be prepared to take different roles at different stages of language teaching and learning process.

Many researches on the traditional role of the teacher have been done. (Littlewood, 1981; Harmer, 1983; Meagan, 1990; Feuerstein, 1997; Li, 1998; Zhang, 2000;) in which teachers' roles as the speech-maker or the lecturer should be replaced by the new and multiple ones such as participants of teaching-learning program, while the students are no longer expected to be the passive receptacles but more possible partners and performers of communicative activities. (Wright, 1987; Widdowson, 1990; Nunan, 1991; Wang, 1996; Wright, 2000)

In the field of language teaching and learning, role refers to a special set of conventions in which teachers and students can identify themselves respectively. As the two human factors in the whole program, teachers and students carry out their own parts that in fact complement with each other. In the

classroom co-operation, teachers actions and their interactions with their students are believed to mirror their own beliefs, which make it possible for languages teachers to play an important and special part in promoting effective learning in significant ways. In terms of foreign language teaching in multi-media context, teaching behavior of language teachers has been discussed. And the roles of language teachers with the assistance of computer have become facilitator of effective learning and prompter of the foreign language and its culture, fostering the right climate for learning to take place, for confidence to develop, for people's individuality to be respected and for moving towards learner autonomy".(Williams & Burden, 1997; Zhang, 2010).

### **3 Characteristic of Computer-Assisted Class**

Different from the traditional language class, computer-assisted language class presents its own characteristics, which is the reason for making a focus on teacher and student relationship an issue. The characteristics of compute-assisted language teaching & learning are as follows:

#### **3.1 Differences from the traditional class**

First, compute-assisted language class is characterized by computer assistance. The use of computer provides the students and their teachers with an important information source, which actually puts forward some new requirements on both parts. With a computer serving as a vehicle for delivering instructional materials to the students, it is very convenient for the teachers to prepare their lectures either at office or at home, and it is also effective for them to pre-design the teaching program. At the same time, students may take advantage of computer as another "knowledge bank", if they like, to carry out their learning in a more active and dynamic environment, rather than to follow the teacher passively. In other words, computer assistance entrusts to the students the initiative.

Second, computer-assisted language class brings about some changes in the relationship between the teacher and students, in which the two parts get more co-operational. Traditionally, the teacher part is always seen to take much control of the process, with teaching as intervention.(Wright 2000) On the contrary, in computer-assisted class, the equal teacher-student relationship lies at the very heart of the teaching and learning, which makes teachers cooperator and reliable partner. With much help of computer, teachers can easily assist the student's performance and also help them develop a sense of autonomy. Consequently the students would feel flexible to pick up languages, which does goods to their fluency improvement and embodies the typical idea of focusing more on using language rather than the language forms themselves.

#### **3.2 Link between teachers and students in computer-assisted class**

The reason why the teacher-student relationship is taken as another very important factor when interpreting the teachers' roles is that the teacher-student relationship reflects their underlying value systems and attitudes held by individuals that lead to different classroom activities and behaviors. And in compute-assisted language class, the teacher-student relationship changes a lot, compared with traditional relation to each other. The positive performance of role relationships affects successfully the way the teacher and the students communicate each other, where learning will be facilitated and the students are more likely to achieve desirable learning outcomes. (Zhang, 2010) In other words, the positive relationship between the teacher and the students is meaningful to explain interpersonal aspects of the participants in classroom interactions, while the negative role relationship between the teacher and the students seems to be a potential threat to student self-esteem and therefore represents a source of psychological stress, which actually places obstacle in the learning process.

### **4 Teachers' Roles in computer-assisted language teaching**

When it comes to the field of classroom language teaching with computer, the roles the teachers play is of significance and of complexity as well. Different dimensions can be chosen to illustrate such characters such as time, class category, occupation and interpersonal dimension as in the Figure.

#### **4.1 Time dimension**

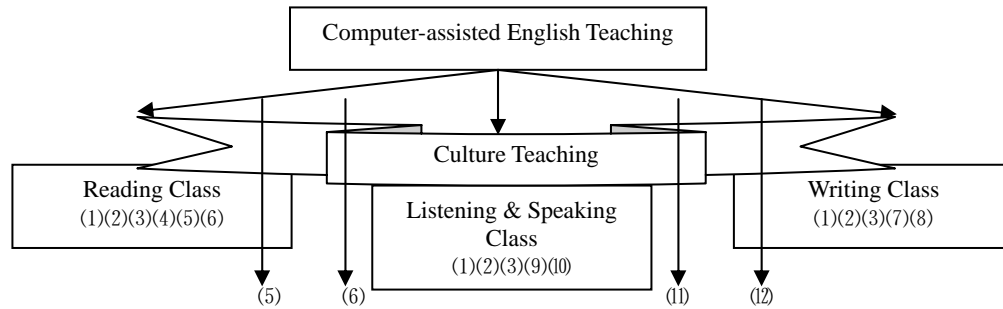
In computer-assisted language class, teachers act as material collector before class, monitor and manager at class, and evaluator or consultant after class.

##### **4.1.1 Material collector before the class**

Generally speaking, before the class, almost all the teachers will do some preparations. The usual preparations of language class mainly covers the introduction to the backgrounds, the grammar points and the vocabulary explanation. Before class teachers often try to collect materials as much as possible which are out of the students' hands. At this stage computer serves as the very "resource bank" which is

quite helpful for the students to understand what they will learn at class.

Besides, language teachers from different college can exchange their materials and experience as with the help of networked computer. For example, teachers download the authentic materials directly from the Internet to get access easily to a number of practice programs designed by other language teachers. Seen in this light, computer is so helpful that it can provide the teachers with some additional materials for them to better their preparations for the classroom teaching. The teacher's role at the phase can be described as material collector, or information selector.



**Figure 1 Teacher's Roles in English Teaching**

- |   |  |
|---|--|
| (1)= organizer of classroom activity                | (2)= participant of classroom communicating          |
| (3)= monitor or a guide of learning                 | (4)= selector of reading materials                   |
| (5)= demonstrator of target language (English)      | (6)= consultant or an adviser of language            |
| (7)= tolerant corrector of errors                   | (8)= evaluator or a consultant of writing            |
| (9)= patient listener                               | (10)= stimulator of students' affective factors      |
| (11)= explainer of foreign language and its culture | (12)= researcher of foreign language and its culture |

4.1.2 Monitor and manager at class

Language teaching in computer-assisted class creates a more authentic environment where target language feels natural instead of created by language teachers. Teacher make use of the instructional software to arouse the students' interest and thereby motivate them to take part in the classroom activities. At computer-aided class teachers become the facilitators or organizers, which may reduce the consumption of their physical power.

Usually students may do their learning on computer respectively. If so, the teacher's task is to give consults and guidance, to organize some communicative activities such as discussions or debates in groups, and to give the examinations. Such learner-centered model makes the teacher monitor the class rather than control it.

4.1.3 Evaluator or consultant after class

Computer can help the teachers to be more scientific and objective in the area of testing and evaluating. A case in point around the world is the TOEFL, which gives a new conception of that "tests can be computerized". In the view of teaching practice computer can help the teachers in the following aspects: (1) to design the testing papers, especially when making decision on the testing range, levels and options (2) to grade the students' examination papers more objectively (3) to analyze the results of the tests scientifically. As a result, the teachers can classify the students into various groups on basis of their scores and become the reliable evaluator or consultant.

**4.2 Class dimension**

As in the figure teachers play different roles at different language class in teaching with assistance of computer. When in different class, teachers act as at least twelve roles to make the classroom teaching more delightful and more effective.

What should be mentioned here is the role language teachers play in teaching culture. On basis of the relation of language and its culture, teaching language should take culture factor into consideration. At surface level, teachers demonstrate the target language and become consultants or advisers of the target language. Only when teachers act as introducer of foreign language and its culture can the classroom teaching be more colorful. And only when language teachers do some research on foreign language and its culture does the communication practice in class become meaningful. From this perspective, language teachers act as a "bridge" with one end to the target language and its culture and the other end to his or her native language and native culture.



### 4.3 Occupational dimension

Banton (1965) puts role in sociological terms as “a set of norms and expectations applied to the incumbents of a particular position”. In other words, once a person is placed in a role, others will expect certain types of his behavior. When it comes to the field of language teaching, the roles of teachers can be occupational, which makes teachers take on more responsibilities and develop more self-satisfaction from the job.

When people do the job of teaching language, he or she is expected to be a model language learner to facilitate effective learning. Sometimes, he or she should do some researches about the target language with the computer. For instance, one can do some semantic analysis in the corpus of any word with the authentic materials. In one experiment after the research on “blue” in the corpus of 5.2 million words, the teacher got 416 blues as occurrences. (Zhang, 2006) Then at class, the students have been cheered up by these interesting sentences that they cannot find in their reference books or dictionaries. By consulting the research documents on the computer, the teachers can specifically update their knowledge and improve professional development and also take part in the international academic exchanges easily at home, which is especially attractive and helpful for those in isolated geographical areas.

As a successful learner and researcher of the target language, language teachers are expected to improve their inner qualities. The more they act professionally, the more they can prove their ability by their successful performances in this new field. And language teachers are regarded as both “insiders” and “outsiders” to the target language and its culture.

### 4.4 Interpersonal dimension

In computer-assisted language instruction, both traditional idea and style of teaching and learning are changed, which makes it possible for the teacher to play a more interpersonal role. Besides as consultants of students, language teachers usually are tolerant corrector of errors made by students, patient listener, and stimulator of students’ affective factors. Seen in this light, the teachers share more equality with students and are on the supportive part, acting as cooperators and partners in inter-relationship of the students. There is a growing body of evidence to show that teaching process is highly influenced by the interpersonal relation between teachers and students.

Although doing computer -assisted language teaching sets higher requirements for the teachers in practice, language teachers still take such a great challenge so as to fulfill interpersonal communication in the computer-assisted instruction, which will have a profound influence on their classroom practice.

In terms of interpersonal communication, the emphasis is shifted from consultation to negotiation in language teaching and learning, in which mutual trust and respect is advocated. The role of teachers is becoming a facilitator and a reflective practitioner to enable the students to explore for themselves.

## 5 Conclusion

In the context of computer-assisted class, language teaching shows differences from traditional patterns, which brings about the variety of the roles language teachers are taking. In terms of different stages of teaching and various class category, the task of teaching enables teachers to become material collector before class, monitor and manager at class, and evaluator after class. From occupational perspective, traditional language teachers are patient listener, equal activity participant, stimulator of students’ affective factors and researcher of the target language and its culture. As far as interpersonal relation to the students is concerned, teachers act as learning supporter or facilitator and reflective practitioner. Therefore the study on the diversity of the roles language teachers play provides valuable insights into language teaching, making the computer- assisted language teaching more effective and creative.

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## International Gift Exchange: A Cross-Culture View

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**Abstract:** This paper discusses the gift exchange behavior in international activities from the view of cross-culture. At first, the paper proposes a concept, namely cultural embeddedness of international gift exchange behavior, and then gets some empiric findings based on the investigation of international gift exchange practice from the international offices of 7 universities in Wuhan. Finally, some principles for international gift exchange are presented.

**Key words:** International gift exchange; Cross-culture; Cultural embeddedness

### 1 Introduction

In the era characterized by rapid development of internationalization and globalization, the gift exchange has already become an important part in increasingly frequent international exchanges. While there will be some differences in the process of gift exchanges due to the differences lie in national conditions and cultures.

There are some international scholars who have already done some related researches on the cross-cultural analysis of gift exchanges during international exchanges. For example, Beatty, Kahle and Homer (1991) had done some work which compared gift-giving influences across cultures. In the book *GIVING A RESEARCH ANTHOLOGY*, Cele Otnes and Richard F proposed that Americans and Germans paid more attention in choosing gifts than French people and Danes since gifts mean a lot in America and Germany. Marcel Mauss pointed out in his masterpiece *The Gift* that the behavior of gift exchange is a social fact which includes many factors namely social, religious, emotional, economic and legal ones. (Marcel Mauss,1950)

This paper aims to analyze the recorded data of gift exchanges collected by foreign affairs departments of seven universities in Wuhan in their processes of international exchange and cooperation with French as well as Japanese universities. Through the analysis, the paper probes into the cross-cultural characteristics of gift exchanges in order to provide some principles in international gift exchange.

### 2 Functions and the Cultural Embeddedness of International Gift Exchange

The main functions of international gift exchange are as follows: 1) Ritual function: the gift giver shows his or her respect to recipient through his or her attitudes, behaviors and speech acts; 2) Commemorative function: gifts convey certain kinds of meanings which are unforgettable; 3) Value function: certain kinds of value and function that gifts conveyed by itself; 4) Cultural transfer function: a gift is a lively carrier of the relevant social and cultural value.

The main feature of international gift exchanges is the cultural embeddedness, namely, the cultural embeddedness happens in the process of gift giving and exchange. Besides, the cultural embeddedness is reflected in all the four functions of international gift exchanges presented above. Then, it will be elaborated in the following part (see Figure 1):

#### 2.1 Ritual function

We need to choose different gifts in accordance with different occasions and objects. Besides, cultural embeddedness influences greatly in the specific ways or means to give or to receive a gift. For example, Chinese people value humility, so even though they give a very expensive gift to others they will still say "it is just a little token to show my respect to you". On the contrary, in other countries people prefer exquisite wrapping; even though their gift is not very expensive they will still wrap it well and present it well. As for receiving a gift, Chinese people intend not to light up with pleasure when receiving a gift and they will always refuse to receive ostensibly. However, in other countries people will be glad to receive the gift and unwrap it in front of the giver in order to share the happiness and surprise with them. Meanwhile, there are different taboos in gift giving due to the effects of cultural

differences.

**2.2 Commemorative function**

Gifts as carriers of memory presented to friend also should have certain value of collection. For example, we can give a precious photo album about "a trip to China" to a foreign leader as a gift.

**2.3 Value function**

The gift itself should have certain value. For example, certain work of art as a gift still has its appreciation space.

**2.4 Cultural transfer function**

More or less gifts will have the characteristics of the local culture, for example, the symbol of the country, locality and company.

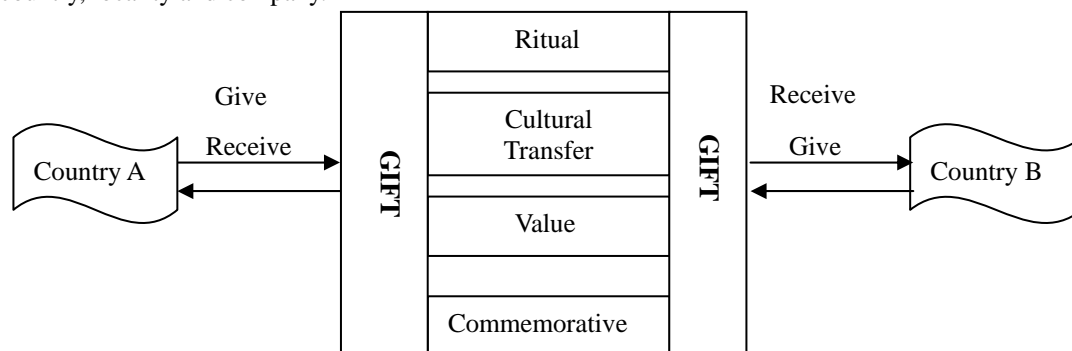


Figure 1 Cultural Embeddedness of International Gift Exchange

**3 Case Study of International Gift Exchange**

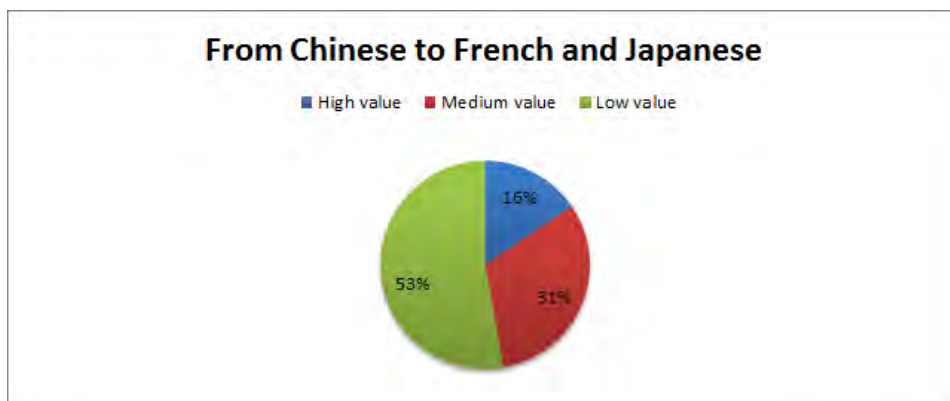
We will analyze the data of gift exchanges collected from seven universities in Wuhan in their processes of international exchanges with French as well as Japanese universities. The data only include gifts between individuals, those between departments or universities are not included.

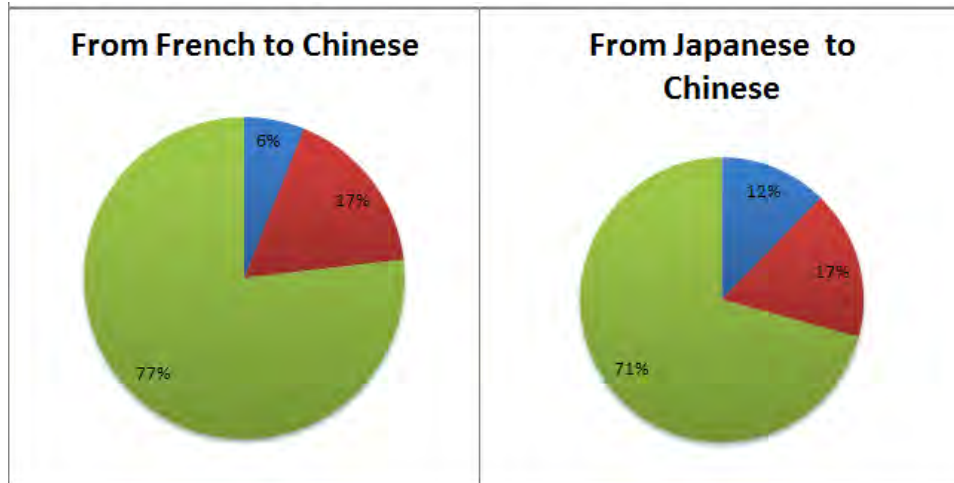
**3.1 Value**

Table 1 shows the statistics regarding to the prices of gifts exchanged among Chinese, French and Japanese sides. In the table, "value" refers to the evaluation of gifts by employees of foreign affairs department according to the quotations on Chinese market. Thereunto, gifts cost more than 500RMB are grouped to be gifts with high value, those cost between 100 and 500 RMB are grouped to be gifts with medium value, and those cost less than 100RMB are grouped to be gifts with low value.

Table 1 The Classification of the Evaluated Value of Gifts Among Chinese, French and Japanese Sides

Number of gifts	High value	Medium value	Low value	Total
From Chinese to French and Japanese	42	85	142	269
From French to Chinese	5	14	63	82
From Japanese to Chinese	16	22	92	130





**Figure 2 The Proportion of Evaluated Value of Gifts Among Chinese, French and Japanese Sides**

### 3.2 Wrappings

Table 2 indicates the wrappings of gifts among Chinese, French and Japanese sides. Wrappings mentioned here refer to those prepared intentionally by gift givers rather than product packaging.

**Table 2 Indicates The Wrappings of Gifts Among Chinese, French and Japanese Sides.**

Number of gifts	Exquisite wrapping	Without wrapping
From Chinese to French and Japanese	102	167
From French to Chinese	43	39
From Japanese to Chinese	117	13

### 3.3 Classification

Table 3 shows the classification of the gifts exchanged among Chinese, French and Japanese sides. We classify all the gifts into four types namely: ornamental gifts for collection (such as the handicraft, the painting and so on), disposable gifts (such as the food, the tea, the wine and so on), repeatedly used gifts (such as the pens, the watch, the USB flash disk and so on) and other types.

**Table 3 The Classification of the Gifts Exchanged Among Chinese, French and Japanese Sides**

Class of gifts	Ornamental gifts	Disposable gifts	repeatedly used gifts	other
From Chinese to French and Japanese	122	10	111	26
From French to Chinese	23	3	54	2
From Japanese to Chinese	18	42	55	15

It can be clearly found out in table 1 that Chinese pay more attention to the value of a gift while table 2 indicates that Japanese value more the wrapping and ornament of a gift. Contrarily, the practical applicability of a gift is what French people value most. In table 3, it is obviously that nearly more than 60% of the gifts given by French people belong to repeatedly used gifts.

## 4 Conclusions

Gift exchanges play very essential roles in international exchanges. The mutual understanding and emotional bond can be strengthened if we deal with them properly. Generally speaking, we should abide by the following principles in international gift exchanges: first, perspective-taking principle. The gift giver should think from the receiver's point of view and the receiver should behave from the giver's point of view in return. The gift giver should take cultures as well as customs into consideration in order to make the receiver happy and comfortable when receiving gifts.

Second, misunderstanding-avoided principle. There are different customs of gift exchanges in different countries, and some of them are even in conflict with each other. Through understanding the

differences lie in different etiquette cultures and value systems, we should avoid the misunderstandings and conflicts caused by gift exchanges.

Third, appropriate principle. We should choose appropriate gifts according to different customs rather than simply choose the expensive ones.

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# Shape the Personalities of the Students in New Period

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**Abstract:** The process of shaping the personality of the students is of vital importance in the future of the students. How to develop their healthy personalities is not only the requirement of the society and times, but furthermore the requirement of the country. This essay, which aims to improve the personalities of the students together with all the educators, analyzes the current situation of the personality and proceeds with shaping healthy personality.

**Key words:** Personality; Healthy personality; Personality psychology; Personality shaping;

## 1 Introduction

Personality, which can show the mental attitude of a person, is the comprehensive outlook of ability, quality, character, motivation, interest, ambition, etc. A person can not necessarily be born to have healthy personality but can get it by accumulating little by little. Students at usual times should attach importance to forming correct ideas and keeping good state of mind in order to shape their healthy personalities. In the meantime, they should take measures to update their knowledge structure continuously and improve their cultural deposits, etc.

## 2 Basic Requirements of The Education for Students' All-Round Development

The basic requirements of the quality-oriented education for the students' personalities are independent spirit and subject consciousness. The quality-oriented education regards people as the centre and tries to develop their personalities positively under the condition that every individual are harmonious with the goal of social development. Try to develop ones' personalities to the fullest and make efforts to the society and country. It includes four characters, which are comprehensiveness, participation, subjectivity and difference. Quality-oriented education reflects the essence and requirement of personality-shaping.

Psychology researches show that personality is the behavioral tendency within a person, and it is a lasting self with consistency and continuity, and it is also a characteristic form of minds which form in the socialization. Personality, which comes into existence between different relationship, is not developed itself but under certain circumstances. A good and perfect independent personality can only form in social relations and the personality-shaping emphasis the all-sided quality optimizing. As far as the students are considered, healthy personality, which is the basis of personality-shaping, can lay strong foundation for the students' integrated development. The school is a important place where the quality-oriented education is carried out, and it is also a essential environmental condition where the personality can be shaped. Educators should try hard to shape students' independent and healthy personalities and improve their healthy development standing at the height of the developing times

## 3 The Temporary Situation of Students' Personalities

Nowadays, the international politics is developing into diversification and the economics become global, which sharp change directly influences people's world outlook, view of life, and values and make great impact on the personality development orientation of the students. In general, temporary situation of the students' personality development is positive. They explore life actively, and they are eager to develop their potential so that they can realize their value. However, in terms of the individuals, there is a negative side, that is presenting a series of confusion and conflict, which becomes more apparent in the weaknesses of the personality. And the definite performances are as the followings:

### 3.1 Lack of lofty ideal and faith

With the acceleration of the globalization of the society, the students get to have universal confusion towards those vague "ideal values" and "political values" in the former days, and they doubt them and even hold negative attitudes towards them. Then they change to a kind of utilitarianism personal value system. They do not care much about political situation and social life, and they even pursue hedonism and pragmatism, which in turn weakens their great ideals badly in this situation.

### **3.2 Full of egocentricity**

Nowadays there is only one child in most of the families in China. The way parents bring up their children, the family structure, the relation among family members etc. all unconsciously exert influence on the formation of the teenagers' personalities. Some parents do not take much care of them and even ignore them whereas some parents consider their children as the apples of their eyes and all the families live for them, protect them too much or even spoil their children. This kind of parents' education methods or family atmosphere will surely have negative influence on personality shaping. Under such family circumstances, children turn to have egocentricity.

### **3.3 Being lazy and fickle, lacking the spirit of being practical, persistent and conscientious**

Complicated social life has such a bad influence on students that they form impatient and impetuous attitudes and cannot concentrate their energy on study. In China, the current situation of college students is that they seldom study at ordinary times while they study very hard when the test is approaching. And most of them are satisfied with just passing it. However, many school children in primary school and middle school are forced to take the various kinds of training class courses. According to the surveys about violating-discipline phenomena, cheating on exams ranks the first of all.

### **3.4 Having no firm willpower or not being able to bear failures**

Many students, especially the only child in the family, shrink back when faced with problems. They can do nothing when conflicts arise and are apt to become quite emotional when getting stimulation, etc.

### **3.5 Loss of integrity and extreme consumption value**

Though students have certain ability to choose, judge and evaluate. While in our real life filled with interests and values diversification, the educators should adopt the orientation of that the mainstream value is to put our nation first, pay attention to the team and willing to help others, eventually the students will use double standards choosing definite values.

## **4 Methods of Personality Shaping**

How to help students shape their independent personalities, find their internal egos and realize their self-value, is a new challenge for educators. As a matter of fact, many excellent educators have gained a lot of valuable experience in educational practice. They have explored good ways, which involve in the society part, school part, family part and the students' part, to cope with personality shaping for students. Here I just elaborate on two aspects: the influences of class environment on the personality-shaping and the formation of healthy minds.

### **4.1 Shaping personality through combination of the class and the students**

#### **4.1.1 Formation of self-awareness in class**

The class plays a role in inspiring and guiding students to form self-awareness. In the process of educational management, on one hand, we should strengthen the degree of students' acceptance of the team and try to change their ideas and behaviors by improving students' status and relationship in the team; on the other hand, the team should cooperate with the educators and help students overcome the weakness of one-sidedness and superficiality, through which students can help themselves promote their self-education. The power of team is great, we can hold some theme meetings to discuss their problems or we can go out to get involved in some social practical activities to contact more people and things, and eventually their one-sidedness and superficiality can be overcome to some degree.

#### **4.1.2 Do self-judgment through class**

In order to develop the analogy function of team to students, educators should try hard to achieve the following: first, we should establish the team goal and individual goal with both social awareness and individual value, and set up class behavior discipline and develop healthy public voices. It can help students refer to the above goals, public voices and criteria to judge themselves and others. Second, educators should evaluate the students and guide them in time so that they can get some inspiration soon.

#### **4.1.3 Do self-examination through class**

Self-examination is a kind of positive self-awareness. Class, as a chief educational department of a school, should exert influence on the process of forming self-awareness together with the educators, and use induction mechanism to help students do criticalness self-examination, which can make this process accomplished and perfect. We can take the following measures: first, we can gather the team and demonstrate. When the team meets failures, we should do some collective self-examination activities, which can shock their heart and set an example for them. They will know that failure and mistake are a



kind of precious spiritual wealth and get beneficial lessons from the self-examination. Second, we should often have communications with students and know about their current mind situation. Third, educators should guide students keep writing diary and develop good habit. They can also collect their diaries, read them and correct them, which is a good way to exchange emotion and views and let them talk about themselves and keep improving themselves.

#### **4.2 Shaping healthy personality**

According to educational practice and our surveys, it is found that there is a wide range of a lost of independent personality among our temporary college students. The definite performances are as followings: hatred for school, running away, anxiety, isolation, suicide, psychopathic personality and even transgression of laws, which shows that it is of vital importance for them to shape their independent and healthy personality. There are internal and external mechanisms in shaping personality. The internal mechanism consists of the following sections that students contact the external information and learn to choose them, integrate them, and internalize them at last. The external mechanism consists of personality cognitive, personality culture, personality environment and so on, which has a positive impact on forming a good personality. We can shape a good personality from the following four parts:

##### **4.2.1 They should set up healthy personality reference value**

The students should keep four elements united, which means to unite psychology, social culture, moral discipline and aesthetic standard. The unity, stressed by the healthy personality, does not mean to make all the people present the same character but emphasizes that they unite the four personality factors and fully realize individual characters. In terms of contemporary students, healthy personality should include comprehensive ability, good relationship, normal psychology, stable emotion and good self-awareness. In addition, students should have the ability to know themselves better, find their interests and grasp opportunities. Meanwhile, they should know the difference between real ego and the ideal ego, and try to make efforts to study and learn to create.

##### **4.2.2 They should have appropriate expectation**

The expectation of a person should be higher than his current situation. But we can see that if a person has unpractical expectation of himself, he may risk his personality in order to get something he wants. Thus, establishing appropriate expectation is the precondition to developing the potential of students and shaping their personalities.

##### **4.2.3 Develop their ability to shape personality themselves**

According to some surveys, the reason why the gap gets wider and wider between society development and the quality of the students is that students lack the abilities to shape their personalities. Thus, the school should lay stress on developing students' abilities to shape their personalities, which is essentially a process for the students to internalize healthy-minded educational information.

##### **4.2.4 Strengthening students' subject consciousness**

It is a very important way for the students to get involved actively in order to shape their independent personalities. Educators should develop their abilities to study and live their life actively. We should develop their social ability and organizing ability in order to help them adapt to all the needs from society.

#### **4.3 Educators' shaping their own personalities**

The author set the impact factor of character shaping as  $a$ , exterior factor as  $a_1$ , interior factor as  $a_2$ , coefficient of interior factor as  $r$ . Therefore, the relationship among the three can be expressed as  $a = a_1 + r \times a_2$ .

A good educator should have wholesome personality, apart from profound knowledge and excellent teaching skills. A good teacher with wholesome personality can create a kind of harmonious and cozy atmosphere, which can make the students inspiring and happy. While an educator without wholesome personality will create a kind of nervous and horrific atmosphere, which may make students uncomfortable. The Psychology and Education has proved that an excellent teacher should have 12 characteristics: (1) cooperative and democratic attitude; (2) kind, tolerant and considerate; (3) patient and persistent; (4) versatile and of wide interests; (5) agreeable looks and personality; (6) equal to everyone and everything; (7) humorous; (8) easygoing and insistent; (9) willing to care about students; (10) flexible at work and have the sprite to innovate; (11) good at using praise methods and respect students; (12) have distinguished achievements and be welcome among students; As a educator we should try hard to possess these characters and develop their independent personalities.

## 5 Conclusion

To sum up, it is a key period for students to form independent personality when they are studying at school. We educators should develop their social and independent personality, and associate with them perfectly, as a result, all the students can grow up healthily, which is a sacred duty.

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## Residents' Perceptions Towards the Impacts of the 2011 China National Disabled Games on Hangzhou City of China

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**Abstract:** The aim of this study is to examine the Hangzhou residents' perceptions towards the impacts of the 2011 China National Disabled Games. Using the data collected prior to the games, an exploratory factor analysis was performed to identify perceived impact dimensions. These identified dimensions were validated with the data collected after the games. A series of t-tests were performed to analyze the differences in perceptions before and after the games. Significant difference was found in the dimension of "congestion and inconvenience". The findings of this study also showed that Hangzhou residents had high perceptions on the benefits and low perceptions on the costs the 2011 China National Disabled Games bring into community. These findings can be used as valuable information for future small scale-sports events organizing/governing bodies.

**Key words:** China national disabled games; Small scale-sports events; Residents' perception, Hangzhou

### 1 Introduction

Sport-based travel has grown dramatically over the past two decades and has become the focus of concentrated academic inquiry. For destinations, sport-based events are being used to increase visitation<sup>[1]</sup>, reduce the seasonality of tourist flow<sup>[2]</sup>, and foster destination development. In the United States, event sport tourism generates an estimated \$27 billion a year<sup>2</sup>, and thousands of people travel significant distances to watch their favorite sports on a regular basis.

A review of literature shows that much of the existing literature on event sport tourism has generally focused on mega or hallmark events, e.g. the Olympic Games, the World Cup. Mega or hallmark events are thought to help position a host city as an international tourist destination. However, some scholars have recognized the downsides associated with these events, such as huge debts for host communities<sup>[3]</sup>, displacement of local residents because of new infrastructural improvements<sup>[4]</sup>, price inflation<sup>[5]</sup>, traffic congestion, increased crime, and culture commercialization<sup>[6]</sup>. Given the challenges associated with hallmark events, Higham (1999) stated that small scale-sports events might result in more positive effects for the host communities as small scale-sports events usually operate within existing infrastructures, require minimal investments of public funds, and are more manageable in terms of crowding and congestion compared to hallmark events<sup>[7]</sup>. He defined small scale-sports events as "regular season sporting competitions (ice hockey, basketball, soccer, rugby leagues), international sporting fixtures, domestic competitions, Masters or disabled sports, and the like". However, few researchers have examined the impacts of small scale-sports events, and the use of disabled sports as a community tourist attraction in China has received scant attention. The purpose of this study were (1) to investigate local residents' perceptions of the impacts of hosting the 2011 China National Disabled Games before and after the games and (2) to compare any perceptual differences between the two time periods.

### 2 Method

#### 2.1 Study population and data collection procedure

The population of interest in this study is all residents who dwell in the host city--Hangzhou. Data were collected twice: prior to the games (August 10 to October 10, 2011) and after the games (November 1 to December 1, 2011). The pre-survey was administered by student volunteers attending the tourism management program at Zhejiang Agriculture & Forestry University in Lin'an, Hangzhou, China. Students were instructed to go to places where many passersby could gather such as bus terminals, restaurants, city halls and asked people to voluntarily participant in the study. After the purposes of the study were explained, respondents completed the questionnaire on the spot. A

<sup>1</sup> Corresponding author. This study was funded by innovation team program for young teachers from Zhejiang Agriculture & Forestry University (2009RC10).

<sup>2</sup> Travel Industry Association of America. Profile of travelers who attend sports events, 1999. www.tia.com

convenience sampling method was employed in the pre-event survey. A total of 480 questionnaires were distributed and 396 were collected, representing a response rate of 82.5%. A number of 90 were discarded due to incomplete information. Thus a number of 306 usable questionnaires were obtained in the pre- games survey.

For the post-event survey, it was conducted by the same student volunteers. They visited the same survey sites and used the same method to distribute questionnaires. A total of 380 questionnaires were distributed and 302 were returned. A number of 50 were discarded due to incomplete information and a number of 252 usable questionnaires were obtained. Therefore, two different samples (one from pre-games and the other from post-games) were collected for this study and Table 1 shows the detailed information on the respondents' demographic profiles, divided into before and after the games.

**Table 1 Respondents' Demographic Profiles**

	Before the games ( n=306)		After the games ( n=252)		Total
	Frequency	%	Frequency	%	
Gender					
Male	138	45.1	106	42.1	244
Female	168	54.9	146	57.9	314
Age					
Younger than 20	30	9.8	24	9.5	54
20-29	183	59.8	153	60.7	336
30-39	60	19.6	33	13.1	93
40-49	24	7.8	30	11.9	54
50-59	9	3.0	6	2.4	15
60 years old & older	0	0	6	2.4	6
Marital status					
Single	210	68.6	174	69	279
Married	96	31.4	78	31	174
Education level					
High school or below	60	19.6	54	21.4	114
College/university	198	64.7	105	41.7	303
Graduate/postgraduate	48	15.7	93	36.9	141
Occupation					
College students	84	27.5	66	26.1	150
Corporate employees	63	20.6	93	36.9	156
Service job workers	90	29.4	60	23.8	150
Business owners	9	2.9	6	2.4	15
Government workers	6	2.0	6	2.4	12
Teachers	6	2.0	3	1.2	9
Professional jobs	24	7.8	3	1.2	27
Others	24	7.8	15	6.0	39
Monthly income					
≤ 1500 Yuan	108	35.3	93	36.9	210
1501-3000 Yuan	108	35.3	75	29.7	183
3001 – 5000 Yuan	69	22.5	66	26.2	135
5001 – 8000 Yuan	12	3.9	15	6.0	27
Above 8000 Yuan	9	3.0	3	1.2	12

## 2.2 Scale

Based on a number of sources in tourism literature concerning the impacts of events on communities, a total of 21 items were adopted in this study. Respondents were asked to evaluate all statements on a five-point Likert scale (1= strongly disagree and 5= strongly agree). Questionnaires distributed before the games aimed to measure expected benefits and costs of the 2011 China National Disabled Games whereas questionnaires after the games measures perceived benefits and costs after the

hosting of the 2011 China National Disabled Games.

### 3 Finding

#### 3.1 Identification of underlying characteristics

An exploratory factor analysis was conducted by using data 1 (before the games). As one of the criticisms that factor analysis often receives is a problem of reliability because the results of the analysis may change with new samples, the data 2 (after the games) were used to validate the results of the exploratory factor analysis. The number of factors was determined using eigenvalue greater than 1. Principle axis factoring extraction method with varimax rotation was used. Items with loading of lower than 0.4 or items with loading of higher than 0.4 on more than one factor (cross-loading) were eliminated. Corrected item-to-total correlation was also employed in this study to decide whether to delete an item. Items with corrected item-to-total correlation below 0.5 were eliminated<sup>[8]</sup>.

The result of the exploratory factor analysis showed that a total of five factors had eigenvalues greater than 1 and explained 67.4% of the variance in the data. In addition, seven items were removed from the scale because of cross-loading on more than one factor. The corrected item-to-total correlation of the remaining 14 items was all above 0.5. Therefore, analysis was finalized with five factors totaling 14 items. These five factors are labeled: “social benefits”(4 items,  $\alpha=0.84$ ), “social problems and price increase”(3 items,  $\alpha=0.77$ ), “economic benefits”(3 items,  $\alpha=0.76$ ), “congestion and inconvenience”(2 items,  $\alpha=0.70$ ), “construction costs and destruction of cultural heritages”(2 items,  $\alpha=0.74$ ). These dimensions were somewhat consistent with the factors reported in the previous tourism impact studies. Table 2 presents the results of the exploratory factor analysis and Cronbach’  $\alpha$  values.

As mentioned above, the result of the exploratory factor analysis was validated using data 2 (after the games). Each item belonged to the factor that it was supposed to, satisfying the factor loading criteria which indicated a good stability of the data.

**Table 2 Results of Exploratory Factor Analysis Using Before-the-games Data**

Factors	Loading	% of variance	Cronbach's $\alpha$
<b>Social benefits</b>		20.23	0.84
Provide an incentive for the preservation of the local culture	0.762		
Provide an incentive for the improvement of the local community public services	0.767		
Provide an incentive for promoting the courtesy and politeness in your community	0.840		
Provide an incentive for promoting community pride	0.778		
<b>Social problems and price increase</b>		14.08	0.77
Increase crime rate	0.705		
Lead more public security problems	0.839		
Price increase	0.606		
<b>Economic benefits</b>		13.36	0.76
Attract more investment to your community	0.733		
Create more jobs for your community	0.814		
Provide more business opportunities for the local people	0.699		
<b>Congestion and inconvenience</b>		11.54	0.70
Cause more inconvenience for local people	0.799		
Cause more congestion in your community	0.732		
<b>Construction costs and destruction of cultural heritages</b>		8.22	0.74
Construction of facilities for the disabled wastes taxpayers' money	0.759		
Result in the destruction of the local cultural heritages	0.884		
Total		67.44	0.79

#### 3.2 Residents' perceptions before and after the 2011 China National Disabled Games

After determining the underlying dimensions, t-test was performed in this study and the results were shown in Table 3. As is presented in Table 3, Hangzhou residents had high expectations on the benefits the 2011 China National Disabled Games bring into their community with all the mean values

above 3.5, and the highly expected benefits prior to the games were “social benefits” (3.74), followed by “economic benefits” (3.59). However, there is no significant difference between pre- and post- games on perceived benefits. As in shown in Table 3, all the perceived benefits had higher mean values than expected benefits, which implies that Hangzhou residents had higher perception about the benefits or gains that the 2011 China National Disabled Games bring into their community, and those expectations were met by the games.

**Table 3 Mean and P-Value Scores for Impact Factors Before and after the Games**

Factors	Mean		Difference	p-value
	Before	After		
<b>Positive impacts</b>				
Social benefits	3.74	3.77	-0.03	0.718
Economic benefits	3.59	3.69	-0.10	0.469
<b>Negative impacts</b>				
Social problems and price increase	2.51	2.30	0.21	0.086
Congestion and inconvenience	3.32	2.91	0.41	0.004**
Construction costs and destruction of cultural heritages	2.21	2.13	0.08	0.527

Note: All items were assessed on a 5-point Likert scale (1= strongly disagree, 5=strongly agree). \*\* $p < 0.01$

In terms of the problems, the highly expected problems before the games were “congestion and inconvenience” (3.32) followed by “social problems and price increase” (2.51) and “construction costs and destruction of cultural heritages” (2.21). The rank of perceived problems after the games was unchanged, there were “congestion and inconvenience” (2.91) followed by “social problems and price increase” (2.30) and “construction costs and destruction of cultural heritages” (2.13). As indicated in Table 3, one of the negative impact factors “congestion and inconvenience” was found to be significantly different between pre- and post- games response with its mean value after the games significantly lower than that before the games ( $p=0.004<0.01$ ). This finding suggested that during the Disabled Games period, the problem of “congestion and inconvenience” did not occur as much as the residents expected. With regard to the rest of the two negative impact factors, residents had low impact expectations and perceptions with their mean values close to or below 2.5.

**Table 4 Mean and P-Value Scores for Impact Items Before and After the Games**

Items	Mean		Difference	p-value
	Before	After		
<b>Positive impacts</b>				
Attract more investment to your community	3.64	3.73	-0.09	0.587
Create more jobs for your community	3.13	3.55	-0.42	0.018*
Provide more business opportunities for the local people	4.00	3.79	0.21	0.106
Provide an incentive for the preservation of the local culture	3.54	3.60	-0.06	0.652
Provide an incentive for the improvement of the local community public services	4.00	3.96	0.04	0.793
Provide an incentive for promoting the courtesy and politeness in your community	3.69	3.62	0.07	0.612
Provide an incentive for promoting community pride	3.71	3.92	-0.21	0.144
<b>Negative impacts</b>				
Increase crime rate	2.38	2.23	0.15	0.299
Lead more public security problems	2.56	2.44	0.12	0.424
Cause more inconvenience for local people	3.32	2.81	0.51	0.002**
Cause more congestion in your community	3.32	3.01	0.31	0.073
Construction of facilities for the disabled wastes taxpayers’ money	2.13	2.04	0.09	0.545
Price increase	2.58	2.24	0.34	0.012*
Result in the destruction of the local cultural heritages	2.30	2.23	0.07	0.615

Note: All items were assessed on a 5-point Likert scale (1= strongly disagree, 5=strongly agree). \* $p < 0.05$ , \*\* $p < 0.01$

In order to get a better understanding of the variations in impact expectations and perceptions of Hangzhou residents, a series of t-tests was carried out on 14 items. Table 4 presented the means scores for all 14 items pre- and post- games. As presented in Table 4, residents expected the Disabled Games to bring many benefits into the community with the mean values of the most benefits items above 3.5, especially two items of “provide more business opportunities for the local people” and “provide an incentive for the improvement of the local community public services” had the highest mean values, which reached 4.00. Among the 7 benefits items, only one item showed significant difference between pre- and post- games with the perception mean value significantly higher than its expectation one. This finding suggested that Hangzhou residents’ expectations on the benefits the games bring into community were all met while the games created more jobs for the community than their expectation.

Examination of the negative impact expectations suggested that Hangzhou residents did not expect the 2011 China National Disabled Games to bring many negative impacts into community. The mean scores for most of the negative expectation items were found to be below 2.6. Table 4 also indicated that among the 7 negative impact items, two of them showed significant differences between pre- and post-games with residents’ perception mean values significantly lower than their expectation ones. Before the games, Hangzhou residents expected that the Disabled Games would cause more inconvenience ( $m=3.32$ ) for local people. However, after the games they realized that the inconvenience caused by the games was not as bad as they expected ( $m=2.81$ ).

#### 4 Discussion and Conclusions

The findings of this study revealed that Hangzhou residents had high perceptions on the benefits and low perceptions on the costs the 2011 China National Disabled Games bring into the community. Residents’ perceptions of the impact of the games have not drastically changed after the games. This finding suggested that small scale-sports events results more positive impacts for the host community compared to the mega events, which is consistent with the finding of previous study conducted by Higham in 1999.

The 2011 China National Disabled Games appeared to generate more social benefits (i.e. preservation of the local culture, improvement of the local community public services, promoting the courtesy and politeness in the community and promoting community pride) than economic gains for Hangzhou residents. Hangzhou residents took the games as an opportunity to improve the public services in the community and they also regarded the games as an incentive for promoting community pride, which was consistent with the previous study by Garnham (1996) that the major impact of an event for the host community was the increase in community spirit or called psychic income<sup>[9]</sup>.

With regard to the negative impacts, congestion and inconvenience caused by the games appeared to be two biggest problems during the game period although the inconvenience was managed better than residents expected. Congestion in public areas, i.e. restaurants, scenic spots may be unavoidable to a certain degree. However, the city government should come up with some practical ways to cope with the problem. For example, alerting residents in-advance about information pertaining to the tourist flows, creating a program for the announcement of situations in public areas. In order to ease traffic congestion during the games, city government had adopted a series of measure, i.e. license plate numbers restrictions, the adjustment of weekends for schools, universities, government agencies, social organizations, etc. which was expected to bring inconvenience into community, but after the games, the inconvenience caused by the games was not as bad as residents’ expected.

As the majority of tourism impact studies have focused on residents’ perceptions on mega or hallmark events. This study has shown that it is equally important to investigate the residents’ perception on small scale-sports events as it can bring more benefits and less costs into host community compared to the mega or hallmark events. What’s more, this study adopts a longitudinal study to investigate Hangzhou residents’ perceptions before and after the Disabled Games which provides a better picture on the dynamics of residents’ perceptions or attitude toward the tourism development in Hangzhou. Specifically, the investigation of Hangzhou residents’ perceptions prior to the games helps games organizing/governing bodies and authorities to identify concerns and expectations prior to the games so that problems can be promptly and properly addressed. The investigation of changes in perceptions after the games can be utilized as an evaluation tool of how successfully the event has been operated. Therefore, the findings of this study provide valuable information to Hangzhou as well communities that plan to host the small scale-sports events.

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# Standardizing and Diversification of Central-branch Library System of Universities: A Case Study of WHUT

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**Abstract:** The paper is a case study on central-branch library system of universities, which has low productivity in reality for reasons in China. The main goal of the system that offer open and equal service and taking advantage of the collection considerably concern the president of Wuhan University of Technology (WHUT) comparatively. Practices with definite object, special management section in charge of the cooperation, the motivation by matching funds and the evaluation were analyzed in the thesis of management by objective (MBO). But satisfaction of the branch staff has an adverse affect on the system invariably.

**Key words:** WHUT; Central-branch library system; Matching funds; Evaluation; MBO; Satisfaction of staff

## 1 Introduction

The aim of central-branch public library system support by the Chinese government in recent years is the accessible and equal library service for all people. New branches emerged, extending the main library to the community with definite goal. While a great number of reference rooms named branch library now in universities of China utilized only by restricted group like the staff, and the idea “restricted material” survived somewhere. It is a remnant of U.S.S.R library system which was not disposal intentionally, although the system form has changed. It coexisted with university library about 60 years. So the concept of “central-branch library system” was acknowledged widely in universities, the goal, the ideas, the system and the cooperation between the central library and branches have not been established in large scale.

Some semi-formal or unsuccessful designs of central-branch library system involving reference rooms have been undertaken by university libraries. A survey of institute/college of law in Beijing, which was issued in the 14th session of ACSSSIRHEI (All-China Society for Social Sciences Information Research of Higher Education Institutes), shows that there is, fairly, no mature model in the district yet.

The crucial problem is the transforming of the idea and the goal, as its result. The mission of library that open the public resource to public equally has not acknowledged actively in universities. And the mandate, as its result, that the materials of reference rooms turn to accessible to all the people in campus has not given to library management section. While the library system of Wuhan university of Technology (WHUT) implement a scheme about 2005, with the idea of cooperation and sharing resource among main libraries and reference. Originally, the purpose was just taking advantage of the latent recourse. After the united network platform was built and evaluations, however, the service, the collection purchase, the principle, the workplace all changed. The goal leads a discovery of the productivity of the system. At first, the task was limit to standardizing the service and the use of found in branches (reference rooms). In 2009, the goal turns to the special collection building based on purchase professionally and diversely.

And now, the staff activity concerns the librarians of the Management Office of Branch and Reference Rooms (MOBRR). “It is evident that it has been a major concern to create jobs and working conditions that satisfy employees.” “Employee satisfaction assessment” has been an essential perspective in the library organization. Actually, the practice of management by objective met problems in cooperation with top management, middle management, line management, and the workforce.

## 2 Exclusive Service of Branch Libraries

Since reference rooms failed to share their resource with a united platform in a last long time, they are not actually branch libraries. Even in the university which took the system namely, only part of branches open to all readers. Others remained unchanged and self-contained, exclusive to specific read. That’s no more than reference rooms.

In the years of exclusive service, reference rooms had become poor in management. Low opening hours, disappointing service, fund abuse and bad management are common. Collection building was stagnant. In a word, reference rooms in the universities are out of management of library and faculty, out

of reader's concern. And the services are not reliable.

The ideas "open, free and equal" were aroused by people like Wu Xi, the librarian of Shenzhen Library about 2006. This refers to the library organization reforming. And the Chinese *National Eleventh Five-Year Culture Development Plan (2006-2010)* promote the construction of central-branch library system in public domain. Meanwhile transform plans about university library were raised. However the voice of providing open and equal service was seldom heard here, which refers to the so-called reference rooms or branch library.

Obstacles stand in the way to open: rarity of literatures, lack of copies, to serve the faculty first, differential treatment to different reader. But problems can be solved by producing and buying copies or e-version, which is an aspect of collection building. Open is the way to find them scholar value via finding and foster their reader. On the contrary, confine the use will obscure even lose their significance. Interdisciplinary researches need comprehensive utilization of literature, which increased rapidly. To restrict the accessibility of them is to confine the growth of research. Differential treatment violates the spirit of modern library. And university libraries are somewhat quasi-public product. So, "Materials should not be excluded because of the origin, background, or views of those contributing to their creation."

Another critical matter is neglect it or treats it simply. Some universities revoke the reference rooms, e.g. Hubei University. In the 4<sup>th</sup> issue of *Library Development* in 2009, the author of *Research on the management mode of department reference rooms in the university* had surveyed upon 30 plan of universities refer to the reference rooms. Some universities merge them into 3 or 4 branches based on different discipline groups (Peking University, Sun Yat-sen University and Wuhan University). All the resources and staff will be reformed. Library should maneuver great resources, and the distribution of collection will face many troubles. Sun Yat-sen University had all the literature of its reference rooms merge to central library, along with their staffs. Based on these, they build three branch libraries divided by discipline. That's no different from cancelling branch libraries, making central library a library with different disciplinary libraries without branches. I think that decentralize services in that cases means nothing, and the intellectual resource of faculties and vitality of diversified construction are gone alongside. In a word, that's too much centralization and less diversification.

"Change, by its very nature, requires that difficult decisions have to be made. These may impact on technology, systems, management styles, capital, organizational culture, the bottom line and many other aspects of management."

### **3 Why the Agreement is so Hard to Actualize?**

In the reform of organization, idea transforming is a part of it. Material is a kind of material. Economic analysis and economic policy is another part of it.

A common way to absorb faculty reference rooms into central-branch library system is that central libraries and faculties reach agreements on fund and staffs. The agreements are on a voluntary basis. Unfortunately, when implementing agreements, both sides, faculty especially, will take cost-benefit into consideration. Who would afford the cost of retrospection? Who is the most benefit from literature service? And it always turns out that the agreements cannot be properly implemented and must depend on administrative instructions.

## **4 Standardized Service and Management**

### **4.1 Standardized service**

The Wuhan University of Technology library system is a success library system. It started from President Prof. Yan Xinping had visited some U.S. universities. He then came up with a library system construction plan. Management Office of Branch and Reference Rooms (MOBRR) is in charge of the plan.

Since 2005, WHUT had outsourced the work of database retrospection to a business. These expenses are covered by the main library. The cataloguing had taken for a long way. After that, the MOBRR urged the reference rooms to complete the retrospection that remained, and put them into retrospection.

Through faculties and the MOBRR, WHUT provide branch libraries with funds. If the faculties would provide more funds to branch library, WHUT would allocate matching fund as encouragement. WHUT is a construction implementer, and faculties are participants in investment which get benefit from it. The branch libraries get from multiple means and the service should open to more readers. The cost-benefit problem brought by agreement mode could be solved.

The salary that faculty can provide are usually higher than library. So WHUT keep the original staffing and the librarian of branch libraries are still working under branch libraries. In the regrouping of libraries, some of the central librarians entered faculties' libraries, making the quality of the branch libraries staffs better.

The MOBRR had also train the faculty's librarians with technique department and purchase department of central library, making them more professional.

The solving of funds and staffing issues, had accomplish the most significant standard library serving mode.

#### 4.2 Management system motivate the staff

The critical measure of the management of faculty libraries is to establish a set of evaluate system, involving standards of collections, service and management, which reference to the central library. The MOBRR organized an evaluating team led by chief librarian to evaluate 21 reference rooms and faculty libraries biennially (triennially after three times).

The evaluation system includes such items below:

1) Open and equal service. After the retrospection of all books in reference rooms had finished, the unified library retrieval platform put into use, though branch libraries, central library and departments of central library had different permission.

Faculty libraries are open to all staffs and students. All the collection must be open. Readers within WHUT can borrow half the limit of central library in faculty libraries, making the total amount that reader can borrow increase by 50%.

2) Unifying annual collection purchase fund, books per readers and its increment.

3) Standardizing branch libraries' opening hours. Branch libraries must open 70hours per week. In fact, most branch libraries had run beyond that and reach the standard of central library.

4) Faculty libraries undertake the extension service for central library, such as collection recommendation, document delivery and consultation.

All these standardization had made service of branch libraries and reference rooms meet the standards of library.

The standardize service is powered by standardized evaluation system. It includes the duties of branch libraries management office; the fundamental requires of system building; the responsibilities of faculty librarians; subject librarian system; the manage system of branch libraries and archives management.

The core content includes responsibilities of branch librarians; the using of matching fund and fund management (includes unifying purchase discount, registration of fixed assets and acceptance of library purchase department); collecting literature data; unifying checkout rules; checkout within unified system; unifying shelving pattern; eliminates all the dated literature; unifying opening rules (unifying opening hours); consultation.; document delivery; counting rules; planning and summarizing and etc..

Through branch management system, the fund can be guaranteed (unified discount, unified acceptance) the checkout also can be guaranteed (unified collection system, unified checkout system and standard), standardizing collection management; standardizing service (opening hours) and service had been extended to vary fields.

The notable change after building the system, the branch libraries use a little fund to attract large amounts of readers of WHUT, and fully utilize the whole collection. The utilization of fund and resource had increased.

What did the staff obtained?

The standardized right of founds use. They come from both the library and faculty, and were check by the MOBRR.

(1)Make the collection plan and implement it.

(2)Explore the collection and sharing it with the reader.

(3)Reader who came from various colleges of the university and their respects.

**Table 1 The Input of Central Library and Faculties to Faculty Libraries, Acquisitions, the Amount of Borrowing**

	2008	2009	2010
Input of central library (RMB)	692815	687700	773400
Input of faculties (RMB)	1128025	1631200	1524400
Acquisitions	13663	18837	19574
Amount of borrowing	31518	39905	48724

#### **4.3 The interaction between central and branch library**

MOBRR would perform evaluation, consulted with the staff two year each, training, tendering, assets check in. Also, it assist branch libraries to get more fund from central libraries and faculties, ameliorate storage condition, get more service from technique department and reservation department (distribution), ask more discount from book sellers and etc.. And branch libraries serve the central libraries with document delivery, book recommends etc.. Regular business dealings can make branch libraries and central libraries work more smoothly. Healthy competition brought by branch libraries evaluation, cooperation between central and branch libraries can make the central-branch libraries system more energetic.

But, in recent years, the staff activity concerns the librarians of MOBRR. The problem rose from "management by object". The evaluation made people tired. And some voice from staff can not be heard with the MOBRR. "Although MBO demands that the superior and subordinate managers should meet and set up the objectives, in practice the objectives come as executive directives from the top management. The lower (or line) managers who usually bear the brunt of such executive directives have to make ends meet." Fortunately, staff of the branch belongs to faculty, that relief the contradiction.

### **5 Diversified Collection Constructions**

Standardization is to actualize and manage service. However, in terms of collection construction, the heterogeneity, diversity and profession of collection are the primary goals. Standardization of service and management depend on the involvement of central library. Collection construction, on the other hand, depends on profession of faculties and the needs to serve faculty, are implemented by faculty.

#### **5.1 Construction mode of university libraries collection is different from those of public libraries**

The central-branch system of university libraries group is different from that of public libraries. Central-branch libraries of public libraries are built by the same entity in different times. However, central-branch libraries of university libraries are built by different entities (universities and their faculties) are built simultaneously. The construction of public libraries are built from up to bottom, unifying all the purchase, catalog and service. In this case, branch libraries are just the extension of central libraries. By contrast, in universities libraries system, branch libraries have independent collecting plan and purchase plan. They can made unique service plan and mode, and even their collection and service can affect central library, making construction from bottom to top.

University libraries have their own HR resource and advantages. Branch librarians can serve the needs of faculty and stand with researchers. They can easily keep in touch with first line teachers, can easily get recommendation, can easily purchase independently. More professional opinions would make the collections of branch librarians more professional. More professional opinion would make faculty libraries more professional. That's what central libraries should not have. It can compensate the disadvantages of less professional collection, and vital to the level of university library. So the devolution of power to the branch was popular in library circle.

In conclusion, universities' branch libraries are not the same as public branch libraries. So, we don't recommend universities' libraries to purchase like public libraries.

#### **5.2 The right and capability in collection building**

The precondition of independent purchase of university libraries are: there exist a planning of collection (special collection planning), information gathering system and subject librarians. Actually, the relations between them can be called right and capability. They are in accordance with right and execute. The planning and gathering of collection are actually the implementation of democracy of library. However, subject librarians can purchase books according to a certain evaluation system. That's the execution which had been permitted. The executers must be professionals. Meanwhile, an evaluation towards executers must be set up. They should be restricted.

Purchase based on recommendation of teachers or directly purchases by teachers are no advisable. That's because in estimating collection structure, determining copies and evaluating literature, there must be participating of subject librarians. And the most efficient and best way for readers to implementing their rights is to provide collecting plans and theme recommendation.

Teachers are the guardians of knowledge, so are subject librarians. In order to restrict librarians, they must be evaluated by readers, just like teachers must be evaluated by teachers. Readers should have the right to score the collection and the right to hire librarians. The evaluation system of the branches had changed in 2012, the ratios of readers assessment increased. Probably it would become the crucial evaluation criteria in future.

Nevertheless the subject librarians system is immature in university libraries in China. There are not criteria for subject librarians, there are not certificate for it, there is no such major in any universities or colleges and there are no training mode for it.

## 6 Conclusions

The transforming that an old system change to a new system needs to import new idea and take the interests of each side in the course of it. When the idea has been established, system reform would be the next item on the agenda. Good management, evaluation, and good networking will increase the productivity of it, and reinforce the system. The process can move forward by various motivations in different stages. The branch library should improve its service in the relationships with the readers by evaluations and subject service. The conception of “open” reveals that the “objects” of the organization which could transform it may come from any side in the relationships.

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# On the Path Selection of the Non-Administration Reform in Chinese Universities

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**Abstract:** This paper proposes that administration of university is the alienation of the historical problems. Now, the non-administration reform in Chinese universities is facing some obstructions from the human, system and culture factors. In order to really realize the non-administration reform target of the universities, the university spirit must be renewed, the academic standard must be returned, modern university system should be established, academic atmosphere should be strengthened, democratic management and professor dominance must be implemented, the social atmosphere of respecting teachers and promoting education must be strengthened, monitoring and guarantee also need to be strengthened.

**Key words:** Non-administration reform of universities; University spirits; Modern university system; Democratic management system; University supervision

## 1 Introduction

Since it was proposed in the *National Program for Medium- and Long-Term Educational Reform and Development* that the administrative levels and administrative management modes must be cancelled gradually in the university, the non-administration of university became a hot social topic. Most of the researchers discussed the non-administration of university from different angles such as establishing modern university system, improving the school-running autonomy, removing the principal administrative levels, constructing the faculty governance mode. I find there are few researchers to study the history background about the administration of university. Based on above-mentioned, this paper seeks the fundamental reasons for the administration of university, deeply analyzes the obstructions of the non-administration of university, and tries to find out the reasonable reform ways.

## 2 Administration of University: The Alienation of the Historical Problems

After the establishment of the People's Republic of China, the status and the function of the higher education have not been paid enough attention in China. In order to pay more attention to the education, give the presidents of university the equal dialogue platform as the senior officials, China imitated the university management mode of the Soviet Union, established the administrative management system of university. In the universities, all the implementations of the funds, the solicit students system, graduation allotment and major setting etc must accord to the national executive orders. As the administrative management system of university was carried out, the resource allocation monopolization and the academic activities utilitarianism appeared, the education ethics lost. Dialectically speaking, the administration has made contributions to the higher education development and the talents cultivation. But now it becomes an important constraint of the higher education development. Under this system, major and scholars right are marginalized, the academicians are seen as salary-men, the principal has the final say to all.

Administration leads to the distortion of the academic value orientation. In order to display their own merits, the university leaders undertake a lot of projects and make the university be deep in debt. The leaders pay little attention on the growth and the future of the students. The desire and pursuit of administrative power lead to the overexpansion of the power functions, the academia has to give place to the power tactics in the universities. University is no longer the holy place of serving to liberate and develop the human personality, cultivate independent spirits of people. Instead, here is filled with deception, the impetuous people and extreme loss of humanistic education. The superincumbent administrative appointment mechanism makes most people pursue money and power, the professor dominance, the democratic oversight of the teaching staff, and learning rights of students can not be really realized.

In order to clean up the detriments of the administration of university, and give the university a democratic and harmonious space, we need to think carefully about the non-administrative of university.

The government, society, universities, scholars and university students must devote themselves to the non-administration reform of university.

### **3 Analysis on the Obstructions of the Non-Administrative Reform of University**

Face to the detriments of the administration of university, many scholars and experts are thinking the reform methods. Most of them present different ways and suggestions from the different angles. However, the administration tendency of university has not changed. Why not? the critical factor is that the non-administrative reform of university is facing some insurmountable obstructions.

Firstly, from the human factor analysis, there still exists some resistance to the non-administrative reform of university<sup>[1]</sup>. Person is not only the reform subjects, but also the reform objects. The main subjects of the non-administration reform of university are university leaders, administrators and academicians besides the related education administration department. Because the administration reform of university inevitably touched or influenced the benefits of the group such as the principals, the secretaries, the division and basic level cadres, even the leaders of the superior departments. This group will do with the administration reform of university with negative attitude, they even opposed the reform<sup>[2]</sup>. Due to the impact of traditional consciousness of official rank standard, the university leaders see the rights and administrative levels as the personal glory capital. In addition, the objective social reality in China is to measure the social status by administrative levels. So the university leaders don't want to fully implement the administration reform.

Secondly, from the system and culture factor analysis, the existing system and policy is hard to support the non-administration reform of university. We need to establish some corresponding measures to support the reform. Higher education is closely related with the social politics, the economy and the culture, the non-administration reform of university inevitable requires the synchronal reform of the social idea concept and policy. If not, it is doomed to failure.<sup>[4]</sup>

### **4 The Path Selection of the Non-Administration Reform of University'**

According to the western modern university management mode, the non-administration of university mainly reflects in university autonomy, academic freedom and professor dominance. Huang DaRen who is the president of Zhongshan University thought, 'Non-administration is not equal to that higher education doesn't need the administration departments to manage it, Non-administration is not to crowd the outstanding scholars who are engaged in the administrative management out of the academic activities<sup>[3]</sup>. Non-administration of university should set up the concept of academic freedom, follow the internal law of university development, realize the university autonomy and professor dominance. Just as GuoWenJing said, "the score of the non-administration of university is not whether to set up the administrative levels but is to liberate university from the government management and to realize the university autonomy."

#### **4.1 The university spirit must be renewed and the academic standard must be returned**

University is the academic hall, the place where the scholars explore the truth and cultivate the high-level talents. In 1711, N.Gundling professor indicated, "The mission of a university is to guide the people to wisdom, that is the ability to distinguish between truth and falsehood. If the university research is limited, the task will be impossible."<sup>[5]</sup> The non-administration reform of university must renew the university spirit and return the academic standard. From the most essential sense, cancelling the administration management and returning the academic standard are to really realize the thought that university is the place for exploring advanced knowledge. The university what as the place of studying academic, enlightening the people wisdom, cultivating the high-level talents and serving the community can better play the role of boosting economic and social development if the administration management has been cancelled and the academic standard has been returned.

Of course, the return of academic standard and the pursuit of academic freedom are needed to pay attention to their limits. The goal of Chinese scholars' concurrent pursuit of academic freedom from politics is that academic activities must be in favor of the prosperity and development of the academic undertakings, be in favor of the development of the country and human society. Scholar lecturing and research cannot be decided entirely by his own subjective values. Lecturing need to help the students grasp the objective fact but introducing the scholar individual claim.

Because the advanced knowledge is out of the public sight, the public are difficult to judge whether the scholars treat their benefit sincerely and fairly when the scholars deal with the academic problems. Based on the case that the scholars are the orderlies of advanced knowledge, people logically conclude

that the scholars are the guardian of their ethical and moral norms. Academic freedom displays not only in the scholars research rights but also in the academic duties. Scholars should abide by the academic standards, the ethical and moral norms. They should take the responsible for their research results and application methods.

#### **4.2 Modern university system should be established and academic atmosphere should be Strengthened**

Academic freedom was originated from the ideal of university autonomy. Higher education will lose its soul without the autonomy. Exploring advanced knowledge is a complex even mysterious inquiry activity, only the scholars could master the complexity of the advanced knowledge. So we should give the scholars the right to independently solve the problems in the research fields. In order to avoid the outside intervention, scholars should have extensive right to deal with academic activities. Establishing modern university system and strengthening academic atmosphere are important guarantees to the non-administration reform of university. Administrator's original function which provide the good service for the teachers and students should be restored. Just as Zhu Qingshi professor thought, the treatment of the university administrators may be high, but they have not the status and the right of the officials. University should win the respect of the society by the achievements in the teaching and research field.

University should take cultivating high-level talents as the basic task. It acquires social prestige by improving the academic level and striving for academic achievements. Just as Chu Zhaohui professor said, the factor that university obtain social recognition is not the administrative levels but its own education level. The facts suggest that university could not get a real ascension relying on its administrative level.

#### **4.3 Democratic management and professor dominance must be implemented**

Administration of university includes two forms: administration of the government department management and administration of the university own management. Administration of the government department management is a state that there are too much government involvement in the university affairs, the autonomy of university is restricted. Administration of the university own management is a state that the university administrators suppress the academic power by administrative power, the university value orientation is distorted, everybody doesn't concentrate on teaching and scientific research but wants to be an officer. Non-administration reform of university must change old management method, implement democratic management.

As far as the administration of the government department be concerned, the government should not only give the university guidance, leadership and management through the proper way, but also give the university autonomy as far as possible. The ultimate goal of the government department management is to enhance the quality of university and maximize the return of cash investment. Just as Gu Yeli professor said, in order to be pulled away from administrative management, the government ought to reduce the items of administrative examination and approval, reduce the functional check and evaluation. What the university need is the support of government.

As far as the administration of the university own management be concerned, the key is to differentiate clearly the professor (or teachers) power and administrator power. University should set up the lawfully, democratic and scientific decision making system to ensure that the professor (or teachers) power and administrator power play good roles. University should change the internal resources allocation method, transform the administrative management type into the service-oriented management type. Under the democratic management mode, the senior administrative leadership of university is elected democratically, the main funds is assigned to departments directly with the respective budget for the teaching and research, compress and simplify administrative institutions, it is the University Board Organizations which is consisted of professors and relevant professional staff that take charge of making relevant academic policy documents.

University should implement professor dominance. In an exclusive interview, Premier Wen Jiabao proposed it must be educators to run university in February 27, 2010. Mr Wen added, "the educators what I said may not be certain professional experts, but they are enthusiastic about education, understand education and are the front-line staff."

#### **4.4 The social atmosphere of respecting teachers and promoting education must be strengthened**

In order to achieve the desired effect in the non-administration reform of university, the ideological baggage that you can get nowhere without administrative levels or administrative power must be put down. The social atmosphere of respecting teachers and promoting education must be strengthened, the status of university staff should get fully respect and guarantee. Rao Zihé professor said, the most



important of non-administration of university is to form the social atmosphere of respecting knowledge, respecting talented person, respecting teachers and respecting students.

We ought to form good environment and establish good soil for educator growth. Zhou Hongyu professor considered the administrative management of university inevitably are docking with the national cadre management system, the university is inevitable leaving no stone unturned to catch up with the existing cadres management system. The key of non-administration reform of university is to find the corresponding cadre management system to avoid the university staff to pursue official rank standard. Cancelling the university administrative levels, adjusting current cadre management system, undertaking institutional innovation and establishing some new organizations are all necessary to the non-administration of university, four afore-mentioned aspects are indispensable.

#### **4.5 Monitoring and guarantee need to be strengthened**

non-administration of university is more than decentralizing to the university, it is also more than keeping balance between the academic authority and administrative power. Non-administration of university needs supervision to eliminate the arbitrary and artificial factors in the operation process of the university, abolish all kinds of disorder and dishonesty, reconstruct an effective university operation pattern. Formulate national laws and university charters to define clearly the boundary of government intervening university, the boundary between the academic authority and administrative power. That is to say, the university implements legal system management to monitor and guarantee the non-administration reform of university to be success.

### **5 Conclusion**

In conclusion, non-administration is the substantial requirement of higher education. It is very important to reflect the background and the obstructions of the non-administration reform in Chinese universities. The non-administration reform in Chinese universities is facing some insurmountable obstructions. In order to really realize the non-administration reform target of the universities, we must make our efforts in remaking the university spirit, establishing the modern university system, implementing a democratic management system, creating good social atmosphere and strengthening the university supervision, etc.

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## Research on Module Teaching for English Major in Independent Colleges

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**Abstract:** The comparison method is used to define the difference between the traditional teaching and module teaching for English major in Independent Colleges. After several years of implementing the module teaching, it is believed that Chinese traditional teaching for English major focuses on the improvement of basic English skills like listening, speaking, reading and writing, the graduates from this model are not able to meet the market needs. Module teaching for English major, which is focusing on training “practical-oriented” talents is conducive to the quality improvement of employment and market requirements. After several years observation, it is proved that Module teaching increases the graduates employment rate, and obtains the better feedback from the employers.

**Key words:** Independent college; English major; Module teaching; Practical-oriented talents training

### 1 Introduction

As an emerging mode of higher education in China, the independent college, co-developed by social forces and well-known colleges and universities, introduces, integrates social resources and educational ones of the organizing body. It has made a contribution to the increase of higher education popularity in China. Additionally, needs for practical-oriented talents dramatically rise with China's rapid economic development, which happens to correspond to the orientation of independent college. People have been always exploring issues about how to choose a major according to market needs and how to make professional training plans.

For China's prosperous economy and progressively increasing international communication with its entry into WTO, English, as an international language, has been popular in Chinese market, which demands more English major graduates as main economic participation body; therefore, many colleges and universities have set up English major. In the beginning of the establishment of independent college, it often copies the existing templates of training plan and course design in the parent college or university. However, in fact, compared with students in first- or second- ranking universities, those in third-ranking ones relatively lag behind in learning basis and habits. Additionally, with out-dated education thoughts, unspecific contents and dull education methods, the traditional course design and education methods in colleges and universities cannot adapt to modern society development, but lead to low education efficiency and go against the training of practical-oriented talents. According to statistics, there are hundreds of thousands of foreign language major graduates every year in China, but among them, not so many are competent to do work related to foreign languages and there are even very few graduates can do interpreting and translation. (Zhou Chenghu & Luo Jiming, 2010) This has challenged the training plan, course design and teaching method of the traditional English major.

We have been researching the subject that how can the independent college, as a third-ranking college, help its graduates be competent to do English-related work by developing a new way of training “practical-oriented” English major talents. The English major in Foreign Language Department, Wuhan University of Technology Huaxia College is just a reform in this environment. It aims to develop module teaching in its training plan and course design.

### 2 General Education in the First and Second Year of the College

Derived from liberal and general education put forward by Aristotle, general education is a part of higher education. It basically aims to complement specialized courses learning through general knowledge, society and natural science education, to correct the deformed development caused by excessive specialized training, and to help students not only know how to do, but also know how to be. From the course design for English major, the general education includes required courses about general knowledge, society and science like basic principles of Marxism, outline of Chinese modern history, ideological and moral culture, basic laws, mental health education, computer application and practical writing, etc ( Zhang Zhengjun, 2009). The academic basic courses include pronunciation practice, oral

English, listening, English writing, English grammar, extensive reading and so on

### 3 Module Teaching From the Third Year of the College

In the third year of the college, students choose their module based on their interests and employment orientation in the future. There are three modules for them to choose from: business English module, interpreting and translation English module and language and literature module.

#### 3.1 Business English module

There are research-teaching type, research type, teaching type and skill and practical one in the pyramid level system formed among Chinese colleges and universities. As a skill- and practical-oriented college, Huaxia College mainly aims to train senior professionals and to help students equip themselves with professional knowledge and strong practical ability. Therefore, it comforts to the thought of “focusing on specialty and practice” when designing courses and adopts the mode of “specialized courses + practical activity”: with employment as its orientation, the design of the former should emphasize the practicability of its contents and students’ adaptability to its degree of difficulty; the latter emphasizes the basic skill training level including listening, speaking, reading, writing and translating of English and the practical training level including class simulation, social practice activity, professional practice, graduation field work and graduation project, etc.

Due to enrollment expansion, the traditional elite education in colleges and universities has become mass education, the system of which has developed graduates with defects in many aspects of ability, especially the ability to adapt to the society and that to do practical work. In other words, there is a gap between higher education and practical ability in the society. (Zhang Meiyun, 2010). In order to fill this gap, training plan of colleges and universities should be reformed: the college should increase the proportion of practical contents; cooperate with enterprises, develop order-type training and invite responsible people of the enterprises as guest professors to give lectures to students; and prolong professional practice and graduation field work, so as to help students be competent to do the work as soon as they graduate.

Foreign Language Department Wuhan University of Technology Huaxia College has established fifteen Practice Bases around China, involved with many different institutes such as foreign trading companies, translation companies, English training institutes, secondary schools, World 500 enterprises, etc. Through combining the course and graduation practice, our students could find out what they lack. What’s more, it also pays attention to adjust education schedule in according to the problems its students encounter with and the advices and requirement of the practice units, so that the students of it can meet the demand of employers and enable its students to find satisfied job with an easy access.

Business English module is characterized in integrating business and English, compared with general English major. For this reason, it is more suitable for the trend of China’s entry into WTO and the students will thus have a more bright employment perspective. It engages in fostering students who are comprehensively competent in business, English and practical operation. A student like this is the kind of employee that the society needs most badly and will sign him or her up as soon as graduation. And this is the students’ competence the business English module strives to enhance.

The main courses of Foreign Language Department at the early period of its establishment include International Trade Law and Negotiation, Cambridge Business English, International Trade Practice, Business English writing, etc (table 1). The certificates towards which the department provides related training include BEC Certificate and National Foreign Trade Merchandiser Certificate.

**Table 1 Basic Language Courses and Business Module Courses**

Basic Language Courses	Business Module Courses
Essential English	Introduction to Enterprise Management
Oral English as Foreign Teacher	International Business English Writing
Listening Practice	Cambridge Business English
Extensive Reading	International Trade Practice
English Grammar	International Business Negotiation
English Writing	business Etiquette, Practice For International Business Documents(optional)

#### 3.1.1 Methods of business English module teaching

##### (1) Business Professional Teachers

Teachers from Economic and Management Department are hired to giving lessons to our students, which make up the deficiency the teachers of English major have. As a result, the students could make reference from each of the English course and the business course.

(2) English Teachers' Training

We sent our teachers to some time-honored colleges and universities related to economy and commerce to really merge themselves with regular business education atmosphere by giving trial lessons on their own and watch the education course, hence the close experience. It helps popularize advanced education philosophy and improve the education content of business English into a high standard.

(3) Textbook Chosen

For oral competence which is one of the language ability to train, business English module related book is chose as its textbook to let the students adapt to the business English terminology and adeptly apply it into practical operation.

**3.2 Translation and interpreting module**

Huaxia College, located in the hinterland of Optics Valley, processes translation deals worth hundreds million Yuan. However, the fact is that the graduates from traditional English majors can hardly be qualified translators or interpreters, which is the purpose we start the translation and interpreting module.

3.2.1 Input more in teaching facility

(1) Simultaneous Interpreting Booth

A Booth for Simultaneous Interpreting has been established, available for both international academic meetings and education of interpreting. The international meetings to be held here will, in one hand, enable the students with more opportunity watching English lecture on spot, and, in the other hand, improve the influence of Huaxia College, which makes it more possible for holding more interpreting activities.

(2) A CAT Room

Computer-aided Translation Room has been arranged and the students and teachers have formed a translation group, which bought particular translation software and established translation database. The translation orders it has taken bring the students opportunity of practice and make profit.

(3) A English Discussion Room

A English Discussion Room has been established for the communication between the students and faculty when the translation group encounters with some translation problems.

3.2.2 To Make our faculty qualified both in theory and practice

Foreign Language Department encourages more young teachers to get further education in top colleges and universities at home and abroad. Every term, a young teacher must undertake interpreting job 2 or 3 times and complete translation work of more than ten of thousand of words or Chinese characters, meanwhile, he or she should fulfill the education quest.

3.2.3 Arrangement of interpreting lessons (figure1)

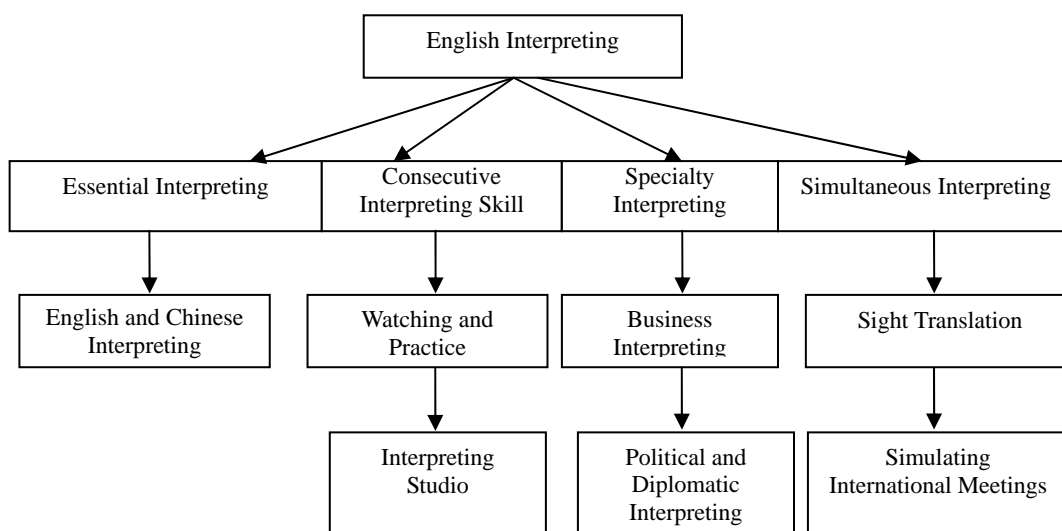


Figure 1 System of English Interpreting Courses

### 3.2.4 Interpreting Skills (techniques) Training

#### (1) Short-term Memory

It includes repeating practice using single language, delayed repeating practice using single language and source language repeating practice, etc.

#### (2) Note-taking and Note-reading

We establish self-created notes and teach students to understand that, so as to make up for the short-term memory.

#### (3) Shadowing Exercise

To train students' ability of listening and speaking simultaneously and distribution of their attention

#### (4) Reconstruction (Liu Heping, 2005)

Since time is limited, the interpreters are requested to reorganize the information into target language.

#### (5) Interpreting Figures

Figures interpreting is the most difficult part for students, we can differentiate and interpret the figure in Chinese and English ways like dot 3 and dash 4 for some big figures.

#### (6) Cultivating Split Attention

Training students' ability that listening or shadowing and backwards counting at the same time.

### 3.3 Language and literature module

The students planning further education such as taking part in postgraduate entrance exam could attend the lecture of language and literature module. ( table 2)

**Table 2 Basic Language Courses and Language and Literature Module Courses**

Basic Language Course	Language and Literature Module
Essential English	British and American Literature, Society and Culture of Britain and America
Advanced English	Instruction to Linguistics
English Writing	Education Approach of English
Oral English Practice	College Chinese

## 4 Conclusion

After several years of implementing of module teaching for English major by of Foreign Language Department, Huaxia College, it is believed that module teaching, which focuses on training "practical-oriented" and develops its training plan and course design based on market needs and students' employment orientation, is superior to Chinese traditional English teaching, which concentrates on basic English skills teaching like listening, speaking, reading and writing only. Besides, by impementing of module teaching, the English Major students have had stronger interest in learning English and it has become very popular to prepare for certificates. The business module concerns about BEC Certificate of vantage level, National Foreign Trade Merchandiser Certificate, etc; the interpretation and translation module includes Certificate in Advanced Professional Translation & Interpreting and Certificate in Intermediate Professional Translation & Interpreting; language and literature module provides tutorship about Teacher Certification, etc. Our students hence will get more employment opportunity and are more likely to have well-paid jobs corresponding to their majors. In conclusion, the module teaching has helped input great amount of "practical-oriented" English talents to the society.

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# On Construction of Innovative Culture and Cultivation of Talents in Higher Education

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**Abstract:** Higher education is an important force in implementing the strategies for “renovating a country through science and education and empowering a country through talents” as it serves the two tasks of technological progress and talent cultivation. The construction of innovative culture on campus is key to the development of higher education which is essential for sustainable development of modern universities and their cultural heritage. The paper proposes that much emphasis is needed to carry out the construction of innovative culture to fully upgrade the innovative capability in higher education. When the university achieves leaping success, quality of university graduates is enhanced at the same time.

**Keywords:** University; Innovative culture; Construction; Talent cultivation

## 1 Introduction

In 1912, J.A. Schumpeter first used the term “innovation” in his book *Theory of Economic Development*. Till now, innovation is widely highly regarded by the international community.<sup>[1]</sup> Innovation is the result of creation and represents the advanced production force and advanced culture which benefited social progress. Innovative culture refers to all activities in innovation and synthesis of its methods and fields, a combination of culture as the subject and environment as the object. A innovative culture in higher education refers to creating a positive ecological environment for scientific research that encourages progress, courage, creativity, cooperation and tolerance to failure. It is the essence of university culture in the 21<sup>st</sup> century.<sup>[2]</sup>

Compared with top universities in the world, universities in China lag behind in cultural innovation. Much progress has been made in recent years with the support of “211 Project” and “985 Project”, especially in the key universities, but the gap between Chinese universities and the world top universities still exists.

## 2 The Background of Innovation Culture’s Development in Universities

Universities are the main channel of training innovation talents, and the important base for talent cultivation. The university culture is the soul of university, the key to differ universities from the other social organizations, and the core of the existence and development of universities. Meanwhile, innovation culture is the essence of university culture. Jiang zemin pointed out in the Third National Education Conference: “Education is the main base for the innovation, dissemination and application of knowledge and it is also the cradle of innovative spirit and talents.”<sup>[3]</sup>

The university innovation is not only the determinant of the rise and fall of the university, but also the foundation and guarantee in the process of social knowledge innovation. As long as we strive to foster and build innovation culture can we improve comprehensively the quality of higher education, cultivate more outstanding innovation talents, enrich constantly the advanced culture and promote the sustainable developments of the national economy and the progress of the whole society. Universities are not just the reflection of change in society, but leaders of the social culture and thoughts. Therefore, the university innovation culture plays a more important role in the development of human society.

Firstly, the university innovation culture can help to create more innovation talents. A rich innovative culture atmosphere in university can better stimulate students to explore their interest in science. The systematic teaching activities and careful guidance of teachers can also arouse students’ interest so as to enhance the level of knowledge and innovation capacity, and cultivate more outstanding innovation talents with reasonable knowledge structure and comprehensive capacities.

Second, the university innovation culture can help to cultivate innovation and transform their achievements. The university innovation cultivation provides a good environment for knowledge innovation, technology innovation, system innovation, culture innovation and etc. Under this favorable

situation, by bring the innovation talents of various disciplines, universities make them innovative through academic exchanges and conferences, and facilitate their finding of innovation resources and partners for exploring markets and realizing the transformation of innovation achievements.

From the historic perspective of higher education, universities are inherently related to the social development at that time and at the later time. The revolution and innovation of university are closely linked with those of the society. The enduring and effective innovation activities of modern universities must be on the basis of the university culture. As the essence of the university culture, innovation culture provides enduring vitality and innovative driving power to universities. The university innovation culture should consist of the science spirit of pursuing truth, the management system of academic autonomy, and the strong material support.

### **3 The Current Factors Restricting the Development of Innovation Culture**

#### **3.1 Chinese traditional culture and operational institutions hinder the construction of innovation culture**

The traditional Chinese culture prefers to the theory that man is an integral part of nature and humans should revere the power of nature. In the study of nature and the heritage of culture, the Chinese people always emphasize on inheritance, experience and laws of ancestors. Besides, Confucian tradition, especially the imperial examination system which lasted for thousands of years, has led to the scholars' obsession of authority so that people developed habits of sticking to conventions and hierarchical order. The above mentioned worship to authority and overemphasis on heritage are the biggest obstacles to science development and technology innovation. Since the Renaissance, the western society has begun to oppose religious authority by humanity, advocate science and obey the natural order. They dared to suspect and criticize the authority, and gradually formed a new set of value system which resulted in the rapid development of science and the rapid progress of economy and society. <sup>[4]</sup>

Having been constrained by the system and mechanism for a long time, many students and faculties in universities lack of innovation spirit and awareness; what's more, the university mechanisms are rigid, which leads to the oversupply of labor and greatly weakens the enthusiasm of the teachers. Therefore, we believe all the progress of cognition and innovation developments derive from the criticism and transcendence of the pre-existing cognition. Whether a nation or a kind of culture can establish a true sense of critical spirit depends on their encouragement on innovation, progress and development. There is a lack of open and critical academic communication in the current Chinese academia. Consequently, our attitudes toward academic criticism will directly influence the establishment of our expected scientific culture. Profound, candid and insightful criticism is much better than the "harmony". <sup>[5]</sup>

#### **3.2 Utilitarianism prevails in academia, and there is a lack of life-long dedication to scientific truth**

Many scholars lack of the spirit of exploring of truth and dedicating to truth. They engage in scientific researches with a state of mind full of utilitarianism and lack of the scientific spirit of "for the truth of truth", and they also lack the spirit to pursue the first-class academic and achieve first-class innovation research achievements. Some researchers engage in researches in order to get promotion; and the students study for the purpose of getting good jobs, passing examinations and graduation. <sup>[6]</sup> The faculties in the universities lack of first-class aspirations and ambitions, and the enthusiasm of dedicating to science. They lack of initiative in the innovation of scientific research and haven't formed the innovation-oriented value system.

#### **3.3 The official standard thought is too strong, and the administrative authority over intervenes in the development of universities**

Universities in China, especially those modern universities, from the start are established through the promotion of the government, and are under the direct management of the government. The administration modes applied in universities are divided according to different administrative levels, which give rises to the over-interference of administrative competent department in the operation of university. Therefore, colleges and universities lack of authority; the internal resource allocation of universities is over administration-oriented; the implementation of professors' academic rights is inadequate; things are dealt with through administrative sequence rather than the academic democracy of professors. At the aspect of university management, the deficiency of incentive system, allocation system, as well as the revolution of personnel system all result in the poor mobility of personnel and hinder the innovative pioneer talents from taking important research and teaching positions.

#### **3.4 The cultivation of innovation talents is inadequate**

Compared with the foreign high-level universities, the universities in China are weak in mobilizing

students' learning enthusiasm and initiative, as well as cultivating students' innovative and practical abilities. Colleges and universities in China tend to value scores, cramming and tradition rather than quality, ability cultivation and innovation. <sup>[3]</sup>

On the aspect of construction, software construction can not keep up with hardware construction; the blind increase in enrollment leads to the decline in quality of teaching; the area of universities is expanded without corresponding school-running characteristics and development concepts; on the aspect of talent introduction, the cultivation and introduction of master's-level talents are ignored. In addition, the changeless model of teaching and evaluation system can not help to create an environment for personality development, which hinders the cultivation of students' innovation potential.

### **3.5 Social context and college students' internal factors**

Nowadays, China's socialist market economic system is gradually established, which has enhanced people's sense of competition and promoted the social development. However, the confusion of transitional period inevitably influences the values of some university students and impacts their sense of dedication and collective concept, which makes it difficult to achieve the goals of university cultural development. On the other hand, the whole society's pattern of interests is changing. With the continuous deepening in Chinese reform and opening and the adjustment of interest pattern, the social competition becomes more and more fierce. The students find it is harder and harder to get the satisfying social status, occupations and income; therefore, they are forced to consider the immediate interests and their future development, contributing to the sense of utilitarian and hindering the construction of campus innovation culture. Lastly, it is because the diversified roles of international society. With the reform and opening and the development of market economy, international changes become more frequent. On the one side, we introduce the advanced technology and management of the capitalist; on the other side, we also absorb a lot of junk. Some students can not withstand the sugar-coated bullets and gradually lose their ideals and beliefs, going against the integration of campus innovation culture. <sup>[7]</sup>

## **4 Pursue the Ways To Strengthen and Improve the University Innovation Culture**

### **4.1 To derive innovative spirit from traditional culture**

Universities are particularly in need of spiritual support, with innovative spirit, the core spirit of modern universities. The traditional Chinese culture has a long history and a clear evolution path. With a long-term historical accumulation, as well as development and changes in different period, the traditional Chinese culture has been promoted and developed in thousands of years' vicissitudes. Based on the full exploration of their own cultural tradition, the Chinese universities need to keep pace with the times and concentrate on study the traditional culture. Only do they fully understand the traditional culture can they distinguish the good from the bad, and innovate on the basis of inheritance, incorporation, and absorption so as to gradually form their specific concepts school supervision and styles of schooling.

### **4.2 Based on characteristic schooling to establish a university innovation culture value system with independent academic characteristics**

On the basis of its characteristic disciplines, resource, and geographical and cultural background, each university should formulate its schooling objectives and concepts; on the other hand, they need make an effort to create a unique academic atmosphere for breeding innovation culture, reforming schooling concepts and forming specific school characteristics so as to establish a campus culture of the pursuit of excellence, academic freedom, and self-discipline of scholars. In the pursuit of excellence, it covers the pursuit of academy excellence, management excellence, and all the other works. Meanwhile, the university culture favorable to innovation should never be the one largely administration-oriented. Although academic freedom should be restrained by policies and objectives, we must attach great importance to scientific research and real contributions to the country rather than one's own interests. In addition, academic self-discipline is the premise of academic freedom and the important feature of university innovation culture. Self-discipline of scholar means the scholars themselves need to be self-disciplined. Scholars should abide by academic ethics and gain respectability from society; otherwise, there isn't academic freedom at all. Only when the universities establish a culture of pursuing excellence, academic freedom and self-disciplined scholars, can they lead the culture of the whole society and make the culture of Chinese society purer and purer. <sup>[8]</sup> Therefore, the tolerance of the university decides its scope of academic innovation. Modern universities should correctly deal with research risks, promote rational skeptical and critical spirit, and gradually form independent academic innovation culture value system.



### **4.3 Carrying forward the colleges to lead the culture and promote the development of advanced culture**

With the function of foundation and support, cultural construction is the core of development and decides its direction. Innovation culture is a kind of advanced culture and a kind of developing culture. As the culture leader, the university innovation culture is an important part in the whole society's innovation culture. Since the day they are founded, universities have gathered a large number of scientific and cultural talents. Through the diffusion and creation of knowledge, as well as the interaction with society, universities promote the social culture largely. Universities' guidance on the development of innovation culture mainly reflects on their inheritance and promotion of excellent traditional culture, incorporation and diffusion of advanced foreign culture, creation and cultivation of the leading new culture, and etc. Without the inheritance of traditional culture and incorporation of foreign culture, it is difficult to create a new culture leading the development of the new era. If the inheritance and promotion of excellent traditional culture is the universal function of education, the specific functions of universities, especially high-level research universities' are to strengthen the communication with the international advanced culture and advanced academic thoughts, as well as the criticism and incorporation of foreign culture, and widely spread their advanced culture in our society. Meanwhile, universities play a positive role in creating, cultivating, reconstructing, and developing new culture. As the culture leader, universities cultivate talents, and create knowledge culture and more and more direct social service. They are closely related, cooperate and support each other. In the construction of the social innovation culture, universities, which adopt, cultivate and promote new culture, influence profoundly on the development of the whole society.<sup>[9]</sup>

### **4.4 University system is the important foundation of university innovation culture development**

Bath system construction and innovation culture construction are important to the university construction. As the rigid regulation, the former guarantees, stimulates and restrains the development of university innovation culture. Since the former is the foundation of the latter, therefore, in order to construct a unique university innovation culture full of vitality, we must, above all, construct a set of sophisticated university system corresponding to universities' law of development, form the rules abided by teachers and students through the motivation of system, and make them the innovation culture on the spiritual level.<sup>[10]</sup> University system construction needs concretely cultivate and improve the following system culture: firstly, the construction of talent cultivation mechanism and incentive mechanism. As the places for education, colleges and universities are responsible for cultivating a group of young scholars of deep humanities, innovation and rationality, and providing economic and institutional security for their development. Incentives should also be introduced to encourage the scholars' dedication to constructing an innovation-oriented country. Secondly, the construction of scientific teaching content and a sophisticated course system. In order to meet the needs of rapid development in the era of knowledge economy and cultivate innovation spirits, abilities and talents, the latest research contents and achievements should be brought into teaching contents through curriculum reform, optimization of teaching processes and constant renewal of teaching content. Thirdly, universities should establish an academic management system and emphasizes on academic freedom. The protection of scholars to engage freely in all aspects of academic research can not only promote the academic innovation, but also enhance students' innovative consciousness and innovation abilities. Fourthly, the reform of the personnel system should be accelerated to construct and improve the scientific selection and cultivation of talents; the strong scientific research incentive mechanism should be carried out to create an open, fair, and impartial personnel selection and provide a system guarantee for the staff and students to develop their abilities and launch businesses; leverage of systems should be made good use to better attract school resources into innovation activities, and improve the quality and efficiency of innovation activities.<sup>[11]</sup>

### **4.5 A harmonious campus environment as a prerequisite for the development of innovation culture**

The construction of the university innovation culture must be based on an environment conducive to innovation. Only when the harmonious environment which is compatible to the development of innovation culture is established can innovation cultural activities achieve sustainable development.

The harmonious campus environment consists of a harmonious physical campus environment, harmonious interpersonal relations, a humane management mechanism, and an inclusive academic atmosphere. A harmonious physical campus environment is the basic condition of constructing a harmonious campus. In order to construct a harmonious physical campus environment, first of all, the campus building as a whole should be harmonious, which requires a scientific and appropriate design

and planning of the entire campus before it is constructed. Second, the campus beautification and human landscape construction should be improved to highlight the characteristics of the physical campus environment. A pleasant environment should be constructed through a variety of cultural activities in campus for the study, life and work of the staff and students. Harmonious interpersonal relations are the ultimate goal of the construction of a harmonious campus. The education of collectivist concept of honor should be enhanced to make the staff and students firmly establish the common values of loving the university, prospering the university and making the university one's own home, and make them united and seek common ground while reserving differences, and contribute to the common development and progress of the university. What's more, a humane development mechanism is the systematic guarantee of construction a harmonious campus. The school management and system should be people-oriented to reflect humanism; the management mechanism and concepts should be centered on the benefits of the staff and students to fully stimulate their enthusiasm and unit them together. Therefore, they would consciously and voluntarily abide by the relevant rules and regulations of the school, which determines the success of school management.<sup>[12]</sup> Besides, an inclusive academic atmosphere reflects the freedom of thoughts and the democracy of academy. As academic organizations, universities should not only tolerate the criticism of traditions and old concepts, but also accept the challenge of new ideas and concepts. For the sake of cultivating a free and inclusive academic environment, universities should treat academy first, the pursuit of truth, rational criticism and academic freedom as their eternal values and spirits. Therefore, they should strive to get the experts with independent views from different disciplines together to conduct scientific researches and make breakthrough in the universities' development.<sup>[13][14]</sup>

## 5 Conclusion

Cultural construction should be based on the practice of reform and opening up and modernization, focus on the forefront of the world's culture development, promote the excellent traditions of national cultural, learn from the strengths of the nations in the world, and gradually strengthen the appeal and charisma of Chinese socialist culture. As the center for the construction of ideology and culture, universities play an irreplaceable role in promoting and developing advanced culture, and promoting the cultural prosperity and social progress. Universities, especially high-level research universities, are the sources of cultivation talents and the important channels to improve the quality of talents and personnel. Therefore, universities should stand in the front of the era and discipline to cultivate innovation culture, gradually promote cultural innovation, and create a cultural advantage. For their further construction and development, universities should absorb new ideas, theories, and science, create new technologies, knowledge, ideas and concepts, and make them better adapt to the complex changing social environment in the process of reform and development.

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# The Research on Constitution of University Physical Cultural Administrative System Based on Life-Span Purpose

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**Abstract:** The paper studies on the content, studying methods, digital technical platform assistance of life-span physical cultural study based on the concept of life-span physical culture teaching and constitution for university students' physical culture teaching platform. It aims at approaching the university physical cultural administrative system for life-span purpose. Furthermore, consolidating the teaching foundation and renewal of university students' life-span physical cultural structure, this paper supplies a scientific guidance for physical culture teaching in China.

**Key words:** Life-span physical culture, Studying ability, Administrative system

## 1 Introduction

As an important element university physical cultural education means to realize “physical health, psychological health, and social adaptation.” called 3-D target for university physical cultural education. University physical culture gradually turn from amount-pattern to a concept of comprehensive essence model oriented life-span physical culture. Life-span physical culture is made up of 2 respects. One is from beginning of life to its ending people participate physical cultural exercises with a life-span explicit purpose and make physical culture in fact a vital part, The other is a practice course under the guidance of life-span physical culture targeting systemization and integrity, offering chances for activities of physical culture in different periods and different living fields.

Based on the life-span physical culture and through the analysis of university physical culture, structure and learning regulation from students towards physical culture, the paper erects a module overall fitting life-span physical cultural performance for students. The also puts forward the physical cultural lessons module for students' self-teaching ability and a campus digital module of physical culture can be constructed with modern campus network. Thus it sets up a solid foundation for their life-span physical culture.

## 2 The Fundamental Content for Life-Span Physical Culture in University Education

Evidenced by life-span physical cultural purpose and through the knowledgeable structural analysis of university physical culture, the paper inducts the university physical cultural system in 4 abilities for knowledge, rousing, scientific coaching and appreciating in physical culture. This is to realize the purpose for fostering life-span physical cultural performance of students. Please see Table 1 for details.

**Table 1 The Module of Basic Concept for Life-Span Physical Cultural Performance in University Physical Cultural Education**

Performance	Knowledge Oriented	Knowledge Content
Study Ability	Physical Cultural & Sports technology Study.	physical culture and traditional culture, mass physical culture and robusting gymnastic and health
Robusting Ability	Body performance Body morphology Sports biochemistry	Essence comment on ability to metabolize aerobic and anaerobic metabolism ability; Anatomical structure and physiological morphological structure analysis and each observation of the physical index determination, etc. The body's blood lactic acid, blood sugar, blood in urine testing and evaluation, the body composition, enzyme function analysis.
Scientific Coaching	Technical posture Analysis Sports Medical Care	3-D digital and testing strength analysis etc. Injurer treatment and aiding, Sports health care and scientific exercise prescription. Scientific preparing Sports nutrition and implementing measures.
Appreciating Ability	Sports aesthetics. Arena sports appreciation	Health and fitness, sports aesthetic features, competitive aesthetic form. Arena sports appreciation of high level sports teams. Participation of Campus sports competition and gym robusting.

Concretely speaking, those four abilities accommodate physical cultural theory, sports technology, body performance, body morphology, sports biochemistry, sports posture analysis, sports medical care, athletic aesthetics, arena sports appreciation and so on. Therefore based on life-span physical cultural purpose to establish university physical cultural system, is overall and fundamental adapting both comprehensive development of physical cultural foundation and self-teaching both.

### 3 Establishing Teaching Module of University Physical Culture for Life-Span Purpose

The structure of physical cultural lessons normally refers some parts forming one period and each part of teaching materials and organizational work for order, plus time distribution and so forth. The university physical cultural lessons based on life-span purpose are subject to the changing regulation and self-teaching ability for students. It is stressed on the performing ability training. The program mainly includes target, content, teaching organization, teaching time distribution. The teaching activities are usually divided into preparing, basic and ending parts as 3 sections. And at different time sections against taught objectives design various activities, sports loadings etc. concrete structural module can be seen in Table 2 below.

The model is meant for performance education and aims at expanding students' self-teaching space and time, increasing exercising density, enhancing multi-swapping and enlarging teachers' participation etc. Further more arousing subjective initiative, creativeness and activity to increase

the interests of students in classroom and improve the understanding for technology. All with a purpose to beat the target as students' self-teaching and interactivity. The practice plan is shown below.

#### 1) Organizing Planning

Before study of physical culture teachers against demands prepare fully teaching materials, teaching plan, ppt etc. And design the groups needed according to the premises and implements.

Or let students form freely and getting explicit divisions.

**Table 2 Teaching Structural Module of University Physical Culture for Life-Span Purpose**

periods	Biological Performance change	body's ability characteristics	Teaching target	Content and teaching attributes	time
Preparing section	Rising stage	Mainly get ready physiological and psychologically, raising the excitability of cerebral cortex and body in Work.	(1) Students understanding explicit tasks and having one period in order. (2) training in correct posture promoting overall body development. (3) preparing for basic study.	(1) mainly the basic teaching requirements for subject standards; (2) Pre-heating activities divided Into general and special preparation (3) Getting ready For fundamental study.	Occupying Percentage in total: 15%-20%, Approx. 7-9 Minutes.
Basic Section	stabilizing section	Body in best performance and cerebral cortex in most proper status.	(1) students learning and mastering basic knowledge, skill and the methods to exercise. (2) develop students' physical essence enhancing body Quality. (3) fostering good essences for ideology and Moral.	(1) teaching content is arranged according to subject standards and combine school Practice. (1) organizing characters: 1).Study succession is arranged rationally for major content. 2).Arranging auxiliary, inducting Exercise and teaching steps. 3). Confirming training times for each materials and rationally setting the density and sports load. 4). Breaking down in training groups.	Approx. occupying 65% accounting 29-32min.
Ending Section	Falling Section	Fatigue appears and cerebral cortex excitability Falls.	Orderly ending The lesson recovering body To comparative Quiet status and Conclusion is given.	Relaxing kind of exercise with simple Dance and smooth gaming. A summary for the lesson and assigning after class training.	Occupying about 10% For 5 min. of total period

2) Teaching Gist

Arousing interests of students in accordance with the physical culture lessons so as to let them know the contents, overwhelm laziness smelting into learning environment and grasping training for sports skills. In addition, guiding students to make personal study plan, and to select personal training methods. This is to be done by divided groups. An then the stressed points can be analyzed, commented and resolved. As to teaching practicing regulations specific explanations on each technical movement let students master skills in posture, ignoring the accuracy.

3) Learning and Teaching Interactive

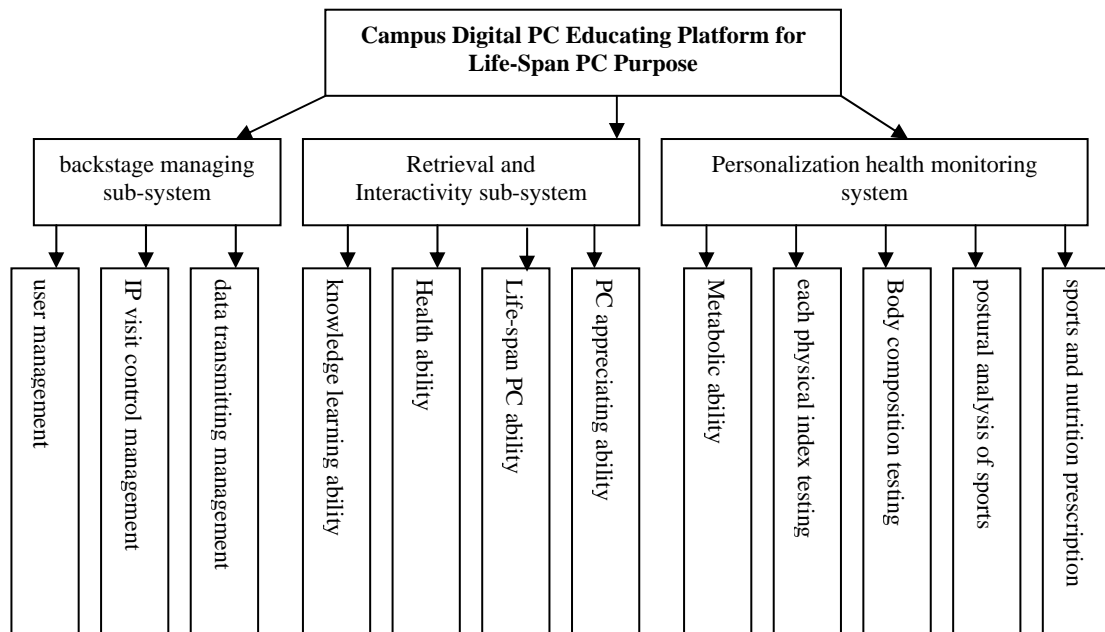
On the basis of self-teaching organizing a facial lecture to indicate the stressed and difficult points and let them train sports skills against special purposes. Then interactivity, team work, individual coaching are introduced. By nice co-op and competition students forged their quality. More over the ability of co-ordination is raised in the course of co-op and fan is fostered. The personality is developed and confidence is enhanced.

4) Self-Commenting and Team Commenting

After the unit study is over each team checks their study and performs. And teacher should regulate the teaching stresses as well find faults. Additionally, under the guidance against the individual situations confirm the adaptable target and making personal studying plan for the content, methods and resource. To effectively fulfill the study tasks. Having a self-assessment and regulation and questioning and practicing. Actively take part in while modifying and perfecting oneself to cultivate PC learning ability.

**4 Construction of Campus Digital PC Educating Platform for Life-Span PC Purpose**

Construction of an inter-active source system by Campus Digital PC Educating Platform for Life-Span PC Purpose, utilizing sufficient combination of modern multi-media inter-active and sports practice can guide students in PC practice and deploy self-monitoring. The self-explore for knowledge, Life-Span PC Purpose may be laid a solid foundation. The campus internet adopting Microsoft SQL Sever 2000 data base can design backstage, subject to data conformity, integrity, co-sharing, reliability, safety, expandability, flexibility and reduce the storage redundancy. Detailed as students user message statistics chart, gym knowledge transmitting data table, PC knowledge information table, healthy data table, PC skills diagramme and words table, teaching and coaching materials in audio and video forms and connecting tables and Permissions configuration chart etc. Shown as follows.



**Figure 1 Diagramme for Structural Module in Systematic Function**

1) user management, includes sub-module for user management, IP visit control module, data transmitting management module. Each module respectively realizes

Users' message, data resource management, updating and renewing functions and Limiting function for users' application range.

2) Retrieval and Interactivity sub-system includes knowledge learning ability,

Health ability, Life-span PC ability and PC appreciating ability. Users through digital platform realize PC knowledge demands and interactivity by assortments of data base, which cover PC theory study, body performance, body morphology, sports biochemistry, sports technological postures, sports

medical care, PC aesthetics, arena PC appreciation etc. in various forms and contents. This is to become an essential way for students to explore PC knowledge.

3) Personalization health monitoring system mainly to establish body performance interactivity and monitoring platform. Its functions are stage testing, height and weight of body, grasping strength, lung's capacity, anteflexion proneness, standing long jump,

as the ability to metabolize aerobic and anaerobic metabolism ability, strength, flexibility as essences commenting. The system anatomical structure and physiological morphology and structure observation and each index testing or so, The body's blood lactic acid, blood sugar, blood in urine testing and evaluation, the human body composition, enzyme function analysis, three-dimensional digital analysis for sports technological postures and force measurement analysis etc. sports injury treatment and aiding, sports care and scientific gym robusting prescription study, the scientific preparation and measures of sports nutrition.

## 5 Conclusion

University Physical Cultural management system established for Life-Span access varieties of selections for University Physical Cultural forms. On the basis of life-span PC universities adopt its PC educating foundations, which is an important behavior in our university PC education reforming and also a trend for PC development. This sufficiently shows the developing notion that university education of PC emphasizes on human foremost. After practice university PC turns from tedious classroom-type to multi-elements and overall knowledge acquisitive module, which expands the way for students to obtain PC knowledge and arouses interests and creative thinking, as well fostering students self-co-op and exploring spirits. The study aims at improving and perfecting university PC management system and has analyzed and commonly assessed on the study of PC technical skills, classroom studying behavior and studying interest in Physical culture by means of university physical cultural content structure for life-span purpose, teaching structural pattern and campus digital PC interactivity.

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# **The Process of Internationalization of JAC Motors in Brazil From the Standpoint of Sustainable Organizational Behavior**

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## **Abstract**

The present study has the target of understanding the process of internationalization of the Chinese automaker JAC Motors in Brazil, as well as identifying if the Brazilian group SHC that brought it to the country and controls its operations in the Brazilian market holds a sustainable organizational behavior. The theoretical basis used to understand the internationalization process was the economic theories described by Dunning and behavioral theories from Uppsala University. In addition, we looked at documents and data from the Chinese government in order to understand the policy towards sustainability and innovation processes in the country. Also a vast bibliographic research has been performed regarding the term sustainable organizational behavior in order to support the research made over the SHC group in which we approached the questions related to the interest the group had on JAC Motors, which drove JAC Motors to get into the Brazilian market, questions regarding sustainable management, resources allocation as well as aspects related to innovation and technology.

**Keywords:** Internationalization, China, Sustainable Organizational Behavior

## **Internationalization**

Internationalization is a concept remounting ever since the beginning of man's history and civilizations. Man has somehow developed several different ways of doing business over the borders. "The entry into international markets involves uncertainties, risks and complexity. Uncertainty results into the need of operating in very distinguished markets than the domestic market, that is, in environments in which the political, social and economic systems along with legal standards may be completely different" (TANURE, 2006, p.07).

Aiming at the enhancing of a strategy for international expansion, companies are searching foreign markets for several reasons, such as, economy of scales studies, need of growth, search of efficient processes and natural resources, manpower availability, access to capital at a lower cost, use of already developed existing technology, specialized knowledge via acquisitions, favorable government measures for tax incentives as well as risk reduction as the geographical variation reduces company dependency on a single market (PORTER, 1986; DUNNING, 2001; YIP, 1989, 1996).

From Porter's perspective (1986, p.260), "one industry becomes global basically because there are economic advantages for a company to compete in a coordinated manner inside several national markets".

Several theories present distinct approaches for the entrance of foreign companies into the domestic market, however this study intends to approach two main currents, one understood as

Economic Theory which main representative is Dunning (1980, 2001) and the other current is the School of Uppsala directing to Behavioral Theory.

According to Dunning (1980), the theory of internationalization with the approach of economic environment explains the decision of manufacturing or not in an external foreign market by means of economic drive where structure and cyclic variables are conditioned, such as, the country's and the industry's characteristics with operation variables and company's specific strategies.

As Dunning (1980) understands companies should prepare to compete with other companies already positioned in foreign markets. They should achieve advantages to make up the costs of operating in new environments. Thus, the author directs three elements: *ownership*, *location* and *internalization* (OLI).

For Dunning (1980) the first element (*ownership*) is about the advantages related to location. These are intangible assets that involve resources developed by the organization which are not available for competitors, and allow a better position in the international market. Among these we can highlight knowledge and technical abilities, the opportunity of investment depending on size of the local market, product diversity and higher productivity.

The second element, (*location*); this is related to the host market receiving the investments. Likely this includes intangible assets resulting from implied knowledge, the existence of location advantages are also favorable to local production rather than exportation and licensing. A company locates their activities to gain access to manpower, capital, material and other cheap raw materials, or to have sales closer to their customers and avoid transportation costs and tariffs. These are attractive alternatives in countries and regions that offer advantages and structures to create resources and capabilities.

At last the author provides evidence of *internalization* where a company analyzes the economic advantages between exportation and local production, if the costs of incorporation and productive organization are lower than the transaction costs associated with the transfer of such capabilities to a local manufacturer, the company will transfer the assets for manufacturing in this market. "When the company internalizes it, this company decides to manufacture to obtain either economy of scale or reduction of the costs of transactions and coordination resulting from uncertainty, and the existence of externalities" (DUNNING, 1980, apud BELMIRO et. al 2008, 2012).

The second current classified as Uppsala University translates actions oriented by behaviors from the business environment of the company also known as Behavior Theory. (JOHANSON; WIEDERSHEIM, 1975; JOHANSON; VAHLNE, 1977, 1990; BILKEY, 1978).

Johanson e Vahlne (1977) yet observed that the choice of target countries follows a certain logic of proximity in aspects such as geography, culture, economy, known as psychic distance, that is, the bigger the difference between the country of origin and the foreign country in terms of development, educational level and content, language, culture, political system, among others the higher the level of uncertainty.

For Carlson (1951), the process of internationalization according to Uppsala University, by analogy it is similar to walk with caution over an unknown site. Unknown conditions of local businesses, customer profiles and their respective acceptance, bureaucratic proceedings, the government changes, distance from the headquarters, all these generate uncertainties for the whole allocation of all kinds of resources.

Therefore, according to this school, companies should have caution in their development within other markets, applying gradual penetration aiming at knowledge and experience within the

local environment. Thus, companies increase the trust for the investment of resources in the country and slowly build the process of internationalization as the learning over the local market grows and provides the foundations for the company's strategic decisions in the foreign market. So on a first moment the company decides to start their activities through exportation what should be at a relatively lower cost of operations and lower risk exposure. (JOHANSON;VAHLNE,1977).

Concurrently, Cavusgil (2011) states that as the company reduces uncertainty over experience and knowledge acquired in the activity they can allocate more resources and progress with internationalization.

In the same line of thinking, authors such as Johanson and Mattsson (1990) finalized the thoughts of the Uppsala University as they informed that as the company increases their knowledge over economic, social and cultural aspects about the competitors among other factors, the organization starts to set and establish their own subsidiary.

Other forms of internationalization are the application of speculative capital in stock market and foreign direct investment which capital is focused on manufacturing and long term results. Internationalization may yet be characterized by the transfer of know-how in exchange of financial advantages, and market policies and strategies.

According to Salvatore (1999 p.25), "international economy deals with economic interdependency between nations. It analyzes the flow of assets, services and payments between one nation and the rest of the world, the policies directed to the regulation of such flow and its effects over the welfare of a nation".

In general, when a company decides for its process of internationalization, the objective is expansion of its products and services into different markets and regions of the globe. According to Cavusgil (2011, p.78) "Companies also pro-actively search internationalization due to several internal forces such as search for growth and customers or yet to minimize the dependency on the domestic market by means of geographical diversification".

We will approach then some policies to support internationalization directed by the Chinese government in order to understand the way the process is operated.

## **About China**

From the beginning of the Reform made by Deng Xiaoping in 1978, China has taken advantage of certain conditions, such as, available manpower, cheap and eager to improve their lives and work conditions; they also take advantage of how attractive their growing domestic market is for international companies and thus they make their economy as flexible as possible generating exchanges and learning. Kissinger (2011) states that in a time of economic crisis, China has played an unprecedented role: "in the past the Western world usually applied to China several foreign restrictions forecasted in their economic policies, now the country is more and more an independent proponent of its own solutions and a source of emergency help for other economies facing the crisis." ( KISSINGER, 2011 p.461).

China has already been the center of world for innovation. Weapons, compass, paper, gun powder and printing were invented over a thousand years ago. Scientist and historian Joseph Needham – whose work Science and Civilization in China has set ever since 1950 this subject in details (WINCHESTER, 2008). According to a document from the U.S.Chamber of Commerce, written by McGregor (2009), it is believed that China lost "their hand" over innovation due to a "bureaucratic feudalism". The Western world took advantage of these innovations, improved them and used them as

a base for centuries of technological domination<sup>1</sup>. Having a model under construction, China produces almost everything under several modalities and association arrangements. It became in 2010 the largest world exporter as well as the second largest world importer only behind the US. A significant part of its importation corresponds to products and components of high added value besides raw materials and commodities. In the last 10 years the country leaders have pointed out innovation as a means of repositioning China in the world and sustaining its development keeping in sight the price this growth has charged the nation: inequality, pollution, poverty in rural areas and environmental degradation<sup>2</sup>.

### **Recovering the role of science and technology and the native innovation.**

When Deng Xiaoping launched the Reform and Opening of the country in 1978, he immediately put his efforts to science and technology as keys to modernize China. Along the 80's and early 90's, science, the reforms of the system of technology and new programs rapidly progressed. This progress of science and technology was *top of mind* raked by President Hu Jintao and prime minister Wen Jiabao when they started their ruling in March 2003. In October 2005, the Central Committee of PCC raised native innovation to a strategic level as that of the policy of "reform and opening of the country" from Deng Xiaoping. Hu Jintao said that China would follow a new path of innovation: "innovation with Chinese characteristics ". Native innovation campaign achieved the level of national strategy that would place science and the technology development in the center of the re-balance for China in terms of industrial structure and development standard (McGREGOR, 2009). Along with this guideline we are able to notice the existing industrial policies directed to production expansion and sustainability of payment balance. These two elements control the pace and the direction of the Chinese IDE and set the degree of intervention from the State (ACIOLY e LEÃO 2011)

### **From volume leader to leader in innovation and sustainability.**

With a strategy focused on development of new technologies, the Chinese automotive industry intends to join quality, safety and mainly environmental issues thus paying less attention to manufacturing records<sup>3</sup>. According to data from International Organization of Motor Vehicle Manufacturers (OICA) in 2011 China manufactured 18,4 million vehicles and holds the position as the largest world manufacturer. In April 2011, the Forum of OICA held in Shanghai in partnership with the Chinese Association of Automobile Manufacturer (CAAM), discussed topics about energy economy, environmental protection, low carbon emission among other important challenges to be faced by the automobile industry. Chinese authorities present at the event informed that the next five years will be a landmark for the transition of the development of electric vehicle industry. Mr Su Bo, vice-minister for Industry and Information Technology Department highlighted:

The 12th five-year plan for the automotive industry forecasts a strong development both technical and scientific over the need of opening of the

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<sup>1</sup> The Economist 25 Year Special Edition – The World in 2011-*Going for a Song* ? Geoffrey Carr. <http://www.economist.com/theworldin/2011>.

<sup>2</sup> The International Finance Corporation (IFC), filiado ao Banco Mundial , *China's Emerging Private Enterprises Prospects for the New Century*, 2000.

<sup>3</sup> Report published in the Brazilian newspaper BrasilEconomico on Oct 14 2011 [http://www.brasileconomico.com.br/noticias/china-busca-lideranca-no-setor-de-carros-sustentaveis\\_108082.html](http://www.brasileconomico.com.br/noticias/china-busca-lideranca-no-setor-de-carros-sustentaveis_108082.html).

Chinese automotive industry promoting independent development and innovation. The development of independent brands needs to be accelerated. The whole system, from product to organization structure should be focused on saving energy, new energy and sustainable development setting up a consolidated base for the automotive segment in the Chinese industry.<sup>4</sup>

## **The Internationalization of China in the World**

Since the end of 90's the Chinese government has adopted an internationalization strategy for their companies as a basic tool for economic development and for the country's geopolitical insertion. "To do so, in the XVI Congress of the Communist Party in 1999 the program Going Global was prepared aiming at the following four major objectives:..." i) increase Chinese investments abroad by means of decentralization and relaxing the authorization concessions allowing Chinese industries to leave; ii) improve of the level and quality of projects; iii) reduce capital control and create new channels of financing for the domestic market; and iv) integrate the internationalization policy for Chinese companies with other existing policies for the foreign segment searching to promote brand recognition of such companies (ACIOLY and LEÃO 2011; HOLLAND and BARBI, 2010).

In accordance with the study made by the Applied Economy Institute (IPEA) in 2011, the flows of Chinese direct investment in the world have multiplied by 60 times between 1990 and 2008, according to *United Nations Conference of Trade and Development* (Unctad). When China started its opening process, these investments moved from a figure close to zero to reach US\$ 830 million in 1990 and later US\$ 52,1 billion in 2008. The acceleration of this growth was higher from 2004 when a series of changes in the policy of incentives to internationalization was implemented. From this point on, Chinese investments were made to supersede the investments made abroad from other Asian countries, such as, Korea and Singapore, and then in 2008 China became the second largest investor among developing countries just after Hong Kong.

The internationalization process of Chinese companies by means of foreign direct investment (IDE) is sponsored and managed by the Government (GUGLER and FETSCHERIN, 2010). Made through loans and administrative proceedings among other incentives (ACIOLY and LEÃO, 2011).

The Government encouraged companies by means of financial devices and ease of administrative processes to perform IDE. For Holland and Barbi (2010), this expansion of the Chinese IDE is a result of the governmental strategy that articulates on one side the control over energy and food vendors, and on the other side, the expansion on sectors where the Chinese industrial companies have been developing (automobile, computer systems and telecommunications etc.), even when there is a vast domestic market to be exploited. The Government's capital is represented by a province or city. These are companies with more managerial independence having part of their ownership structure negotiated in the stock market. Among these we can mention as examples, JAC Motors, Chery, Xuzhou Construction Machinery Group and Chongqing Grain Group.<sup>5</sup>

## **The Internationalization of China in Brazil**

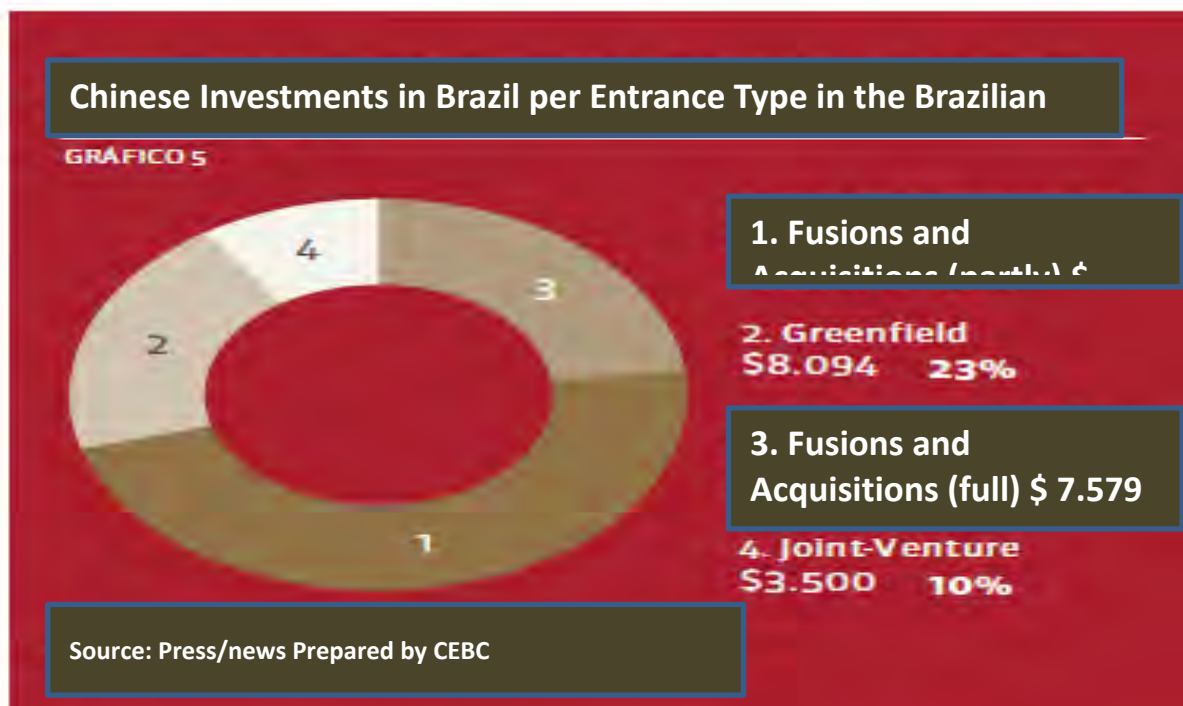
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<sup>4</sup> Constructing the Global High-end Exchange Platform and Leading the Sustainable Development for Global Automotive Industry "2011 OICA China Forum" in Shanghai.

<sup>5</sup> Study published by the Brazil-China Entrepreneurship Council in March 2011

The most usual entrance manner used to announce and bring Chinese foreign direct investments in Brazil has been through partly made Mergers and Acquisitions.<sup>6</sup> The study from the Brazil-China Entrepreneurship Council (CEBC) explains that one of the reasons for such preference is based on the difficulties regarding cultural differences. According to the data from the Applied Research Institute (IPEA) in April 2011, the main sector destination of Chinese FDI in Brazil in 2008 were: retailer business of pesticides, fertilizers and soil correction (37%); manufacturing of semi-finished steel (14,1%); and manufacturing of malt, beer and draft beer (13,7%).

In 2009 it was observed a change in the sector participation of the Chinese Foreign Direct Investment as those that represented the largest participation were the following: multiple banks with commercial customers (73,2%); retail businesses of pesticides, fertilizers and soil correction (4%); and combined services for office and administrative support (4%). Considering that Chinese state industries also sent resources from their base to foreign countries, the flow data for Chinese FDI are distorted and underestimated.<sup>7</sup> In the segment of automakers we highlight the entrance of the following Chinese companies: Chery, JAC Motors, Dongfeng and Sinotruck. These are products manufactured from European designs and international system technician analyst as well as a strong dealer's network and after-sales.<sup>8</sup>



**Figure 1- Chinese Investments in Brazil by entrance means**  
 Source: News press - CEBC / March 2011 ( adapted )

In accordance with the study made by the CEBC, these automakers compete with challenging characteristics, such as, advanced technological resources, proper luxury models, competitive prices regarding the Brazilian industry in equivalent category. Chery and JAC are Chinese Government companies that invest in the Brazilian market. The first one already has 73 authorized dealers and a project announced to install a plant in the country. The latter one which is also targeted at our study,

<sup>6</sup> Study published by the Brazil-China Entrepreneurship Council in March 2011

<sup>7</sup> IPEA studies # 85 April 2011

<sup>8</sup> Special report on China – Magazine ABCD INOVA year 2, # 8 April 2011

JAC Motors has a large dealers' network with 50 units. They adopted the strategy of early internationalization as they have the freedom to sell their cars in other markets. Chery and JAC have existed over 10 years with products found in over 100 countries.

Understanding the Chinese policy regarding global strategies addressing internationalization processes, innovation and sustainability in the world and in Brazil is key, the following will describe the main concepts of sustainable organization behavior by means of theoretical references in order to help us understand how it actually took place in Brazil with the Chinese company JAC Motors.

## **Sustainable Organization Behavior**

According to Derek Pugh (1971 apud Caravantes 2009, p. 27), organizational behavior is "the study of the structure, functioning and performance of the organizations as well as the behavior of groups and individuals part of such organizations".

Organizational Behavior according to Caravantes (2009), is to be concerned with the performance of workers in the organization environment; the effect of formal and informal groups; feelings and actions of workers; the effect of workers over the organization regarding efficiency, efficacy and effectiveness. Yet according to Hobbins (2010, p. 07).

Organizational Behavior is a field of studies that investigates the impact individuals, groups and the structure have over the behavior of people within the organizations with the intent of using this knowledge to improve organizational effectiveness.

Currently, the need of changes in the organizational strategies is inherent to its survival in the globalized market.

For an organization effectively follow these changes and remain solid, one of the strategies to be concerned about is the understanding of this external scenario and implement a system to learn the concepts of sustainable organizational behavior.

It is notorious that the concept of sustainability is today a significant part of the ideas of most communities around the world, how to preserve biodiversity and natural ecosystems, respect the environment and demand from companies social environmental quality in products and services to be offered to consumers. It is within this perspective that Kofi Annan awarded Nobel Prize for Peace stated "Sustainable development is essential for everlasting peace. Above all it is the reason to be for the United Nations".

So in 1987 the United Nations' World Commission for Environment and Development prepared a report called "Our Common Future" also known as "Brundtland Report" which defined sustainable development as "the one capable of supplying the needs of the present generation without compromising the supplying of needs and survival of future generations" (BRUNDTLAND, 1987, p.27).

Trying to make this concept more tangible, John Elkington (1994) created the concept called *Triple Bottom Line*, or tripod of sustainability where he states that sustainability from a business point of view should be based on three dimensions in balanced and interdependent manner as follows: economy, social/human and environment what is demonstrated in Figure 2.



**Figure 2: Tripod of Sustainability**  
**Source: adapted DNV (2010)**

From the same perspective, the Guide for Communication and Sustainability prepared by the Brazilian Business Council for Sustainable Development (CEBDS) in 2008, lists the actions related to the tripod of organizational sustainability as detailed below:

In the economic dimension it is understood that the offer of goods and services at accessible prices at an increasing number of consumers; development of infrastructure for the construction of new inclusive markets and actions to influence and spread good practices for several segments; the incentive to activities for income generation, micro-credit and fight against poverty in the value chain; the expression in sustainability strategies adding value to the relationship with investors (CEBDS 2008).

In the social dimension the development of tools designed to follow up quality and safety of products and services as well as the satisfaction and right to data disclosure for consumers; the development and adherence to laws, regulatory standards and volunteer codes concerning marketing, institutional communication, promotion and sponsorship; the utilization of tools for communication to encourage consumers in a sustainable manner (reduce, reuse and recycle); respect to international labor conventions and human rights, slave work and infant work; respect labor legislation and the right to free association of workers; respect to social, cultural and religious differences and value of ethnic and gender diversity within the company and in their relationship with stakeholders, that is the public that relates to the company; the development of programs for salary leveling between



man and woman, policies, procedures and training of employees and associates in fighting corruption, strategies and programs to improve health conditions for workers and community; creation of strategies and programs to improve the education of workers and the development of qualified manpower, among others (CEBDS 2008).

In the environmental dimension the development of tools for the manufacturing of goods and services allied to a capacity to preserve ecosystems and environmental services.: air, forests, soils, water, energy and food; ecoefficiency in manufacturing processes: produce more generating less environmental impact and consuming less natural and financial resources; optimize the use of raw material, sources of energy and water from re-use and recycling; reduction of waste of raw materials, water and energy; the correct disposal of effluents from manufacturing processes; the capacity to know and reduce the level of gas emission which cause the greenhouse effect in manufacturing processes; the reduction of the impact from the transportation of goods, products and materials used in manufacturing processes and in the transfer of employees; the development of programs for preservation and reduction of the impact over biodiversity; investment in innovation and clean technology for the development of goods and services of quality and high performance; the development of spare logistic processes for the disposal and recycling of products at the end of its cycle of use (CEBDS 2008).

Therefore, we can understand that a company when it starts working with sustainability has as premise of a harmonic relationship between economic agents, community and nature. This implies in a political, social, cultural and ethical revolution, Briefly we can define it as a model that allows economic growth without social exclusion and respects the environment. Its spread will depend on all the actors from the community, the Government, citizens and entrepreneurs to understand that sustainable management is a matter of survival for companies and forthcoming generations.

Ashley (2003) reminds that for some social responsibility represents legal obligation; for others it means a responsible behavior in terms of ethics; for others yet, the message transmitted is to be responsible, and many believe it is charity; and some others take it by the sense of social awareness. Corporate social responsibility is the set of social actions taken by the company aiming at promoting welfare either internally or externally which is seen from broader view as organizational sustainability.

Ethos Institute of Social Responsibility highlights the importance of a way of leading business in which the company becomes a partner and co-responsible for social development. A socially responsible company is the one that has the capability of listening to interests from different parties, such as, shareholders, employees, vendors, suppliers, consumers, community, government, environment, and yet try to incorporate all of them in the planning of its activities, searching to address demands from all of them and not only from shareholders or owners.

Corporate social responsibility may be interpreted and practiced as an ethical compromise from the organization in its actions and relationships with the several publics with which it relates. Thus, the concept goes beyond the legal posture from the company, philanthropy or support to the community, social corporate responsibility is an attitude from an organizational management with the proper value to everyone.

Thus, organizations need to reinvent their businesses and remain profitable, however financially healthy, but also they have to be managed through values and fully in accordance with the system in which it is inserted. "In a world that the natural capital, social capital and human capital are subject to restrictions, considering just a return over financial capital holds back companies into the shadows of a distant past." (SENGE, 2009 p.345). The same author states that today modern companies conceived and managed as "money making machines" are not in harmony anymore.

For Senge (2009) some traditional businesses considered sales to be more important than actually adding value to customers. Side effects of this approach are dissatisfied customers and overflowing landfills, this happens because of the disconnection between organizations and their customers.

In the same line of thinking, author Barrett (2009) informs that we are getting to the era of compassionate capitalism. When selling their products and services, companies need to have basis on values and rules that support common welfare. Ethics and social responsibility are fundamental for the way companies conduct and communicate their businesses. Values that define how companies stand in the community are more and more important on the consumer's decision making and on retaining talents at a company.

“We may carry on spending more time satisfying our selfish needs and greedy egos or maybe we can choose to create a future where we will feel good within, raising our souls and at the same time make it more sustainable for all of us, for the businesses and for the community” (BARRET, 2009, p.24).

For Barrett (2009) companies are yet waking up for this new paradigm. There is still the “cannibalism” being encouraged through numerous limiting values by some companies. Fierce competition, a badge is used as a symbol of power, people are stressed out and afraid of the work environment because they are not able to meet their targets, other people working twelve or fourteen hours per day without any free time to address the needs of other sides of their own lives.

Author Barrett (2009) supports that companies which still feed this kind of culture are short term focused with outdated management and leadership practices. It is necessary to balance this polarity to become an everlasting company with associates who are fully satisfied with their jobs. The change of paradigm is about balance, that is, balance of the organizational and human needs.

Senge (2009) alleges that organizations are recognizing the need of change, either because they need to survive or because they are searching benefits in order to operate in a more sustainable manner, for instance, cost reduction or a better company image. They see the connection between their own survival, advantages of opportunities of advance and preservation of the environment. Companies that are in this stage are going over the line between merely reacting to risks on one side and recognizing the opportunities from active creation of a world in which they will be able to be prosperous indefinitely, on the other side.

It is known that organizations need control to keep the order, however, the argument of the authors is that organization cannot focus business strategy exclusively on this view, but on corporate governance that is open and flexible.

Barrett (2009) describes this level of organizational awareness as adaptability, sharing power of the employee and ongoing learning. The author understands that to encourage innovation so that new products and services are developed, it is necessary that the enterprise goes through changes and incorporates values of flexibility and takes risks during management. In addition we have organizational culture migrating from control to trust, from punishment to incentive, from exploitation to property, and from fear to truth. And thus, mechanisms are set up to promote innovation and learning. The focus simply on financial result starts to disappear as the organizations start to measure its success in comparison to a wide range of indicators. Vision, mission and values are recognized as means to develop a strong organizational identity.

The company is considered a “citizen” when sustainability is fully integrated to the strategy, in general it happens when companies discover

that they have a much wider range of business opportunities, but only if they pro-actively incorporate the factors of sustainability in all dimensions of their business strategy and in the core of their processes of investment and decision making, in all organizational levels. (SENGE 2009, p.115).

Senge (2007) indicates that more and more businesses are incorporating sustainability issues among their objectives for the future. For Senge true innovation demands a distinguished mentality.

Concurrently with Senge, Barrett (2009) says that the primary focus of organizations in this level of awareness is the service to humanity and to the planet. There is recognition of the inter-relationship of life as a whole and the need of individuals and organizations to take up the responsibility for the entire welfare. Internally, the focus of the organization is to create an ethical environment including justice, humility and compassion. Externally, the focus is to understand the impact of present actions in the forthcoming generations, that is, to create a sustainable future for the company and the community.

According to Kuazaqui (2010) companies have been noticing that they can differentiate from their competitors using practices overlooking optimization of non-renewable resources. During many years there has been a concern of contributing financially with programs related to the environment. Currently the practice is to spread the utilization of new technologies and the offer of products and services that are politically correct. Then companies get positive exposure before different groups of interest and at the same time reducing costs, expenses and processes.

Thus, the International Organization for Standardization (ISO), holds together over a hundred countries and regulates by means of ISO 14000, standards that aim at reducing the load of pollution generated by companies in the manufacturing system as well as the wastes of raw materials. In Brazil, the whole process of certification is managed by the Brazilian Association of Technical Standards (ABNT). Companies that meet the standards receive a certification that is worldwide valid. Therefore, in addition to competitive differential, companies may obtain gains by means of economy of scale and productivity reached in the processes of manufacturing.

Brazilian industries have searched cleaner technological alternative and less toxic raw materials in order to reduce the environmental impact and degradation. The community's awareness and the environmental legislation have led companies to a more sustainable relationship with the environment. Companies have been forced to invest in process modifications, manpower improvement, raw material replacement, reduction of residue generation and rationalization of the consumption of natural resources.

In this context for Sachs (2004) the sustainable dimension of development drives us to "[...] search solutions that are triple winners eliminating the wild growth obtained at the cost of highly negative externalities both social and environmental" (SACHS, 2004, p.15).

Sen (2011) completes the theory mentioned by the authors when he observes that in spite of many human activities that follow the process of development may have destructive consequences, yet it is also at reach of human power to enrich or even improve the human environment.

Therefore, the civilian community, companies and the government and all those in charge of the maintenance of the planet we live in.

The following example is of sustainable manufacturing process in an automaker that has been present in the country for the past 87 years.

### **An example in Brazil**

GM Brazil is an American company that manufactures cars focusing on processes that are sustainably managed, besides investing over R\$ 5 billion in the country, and holding almost 600 points of sales and services and the largest line of dual fuel vehicles (gasoline and ethanol) in the market, GM demonstrates that is necessary to manufacture cars focusing on sustainability.

According to Franco (2010) the company has one of the most modern buildings for their technological center constructed in accordance with the concept of “Green Building”, that focus on reducing the utilization of electrical energy and natural resources and the areas of stamping and painting where sustainable practices are also placed at a first level. They value suppliers as business partners and an important part of the compromise of corporate responsibility. The company presents a “zero tolerance” policy against infant work, improper treatment to employees or the practice of corrupted business for the supply of goods and services. In addition to that, they present the guidelines ruling a responsible business conduct including treatment of workers and the role of the company enhancing local communities in which they work.

One of the environmental principles of GM is to reduce the generation of waste. All their units practice composting in which organic residues are transformed into fertilizer for trees and green areas. The company has already designed approximately 1.400 tons of residues to composting. Other sustainable actions are the recycling by means of process of selective collecting of cardboard, paper, plastic, wood, batteries, lamps, metals among others where they recycle 97.7% of what is utilized. In addition, they treat effluents what consists of treating water used in their manufacturing processes and return it to nature. The company is pioneer in the automotive segment as they implemented this type of station in 1951 at their plant in the city of São Caetano do Sul. Other essential issue is the re-use of water which not only creates alternatives to reduce the consumption of potable water. The company re-uses rain water for what it has adopted an automated re-utilization system that collects water by means of pipes and drains and directs it to a reservoir where the water is treated with chloride for later use in lavatories and flush toilet. The company is also aware of an optimized use of water in their manufacturing processes. This is applied in painting, for instance, one of the areas with the largest use of this natural resource. In the stages of pre-treatment, the body of the car passes through several baths in which it is made ready for painting. The area has worked on the re-use of water in more than one stage of washing in order to reduce consumption. Other initiative present in the painting of cars is the use of paints with higher solid content, and thus, the paint has better yield, less smear and a more concentrated paint takes less solvent in its formula resulting into less emissions of volatile organic compounds in the drying hoods.

All GM do Brasil units have an incineration system in charge of reducing 99% of its emission. GM also adopts the practice of turning off all machines during non-productive time as well as eliminating every type of leakage. The outcome of such measures: from 2004 to 2008, GM do Brasil reduced in 35% the consumption of water and electrical energy in their business units. From 2003 to 2009 there was a drop of 51% over electrical energy consumption per vehicle manufactured, and 62% over water. Nanotechnology causes a reduction of 90% on the generation of phosphate burr and saves the consumption of 26.000.000 liters of water /year. In the technological center in the city of São Caetano do Sul, a more efficient air conditioning reduces 13% the consumption of energy. With the use of glass cups, 1.320.000 plastic cups/year were eliminated. With the elimination of plastic bags to wrap silverware, 624.000 plastic bags /year were eliminated. GM do Brasil also invests in social projects as part of the company’s strategy supporting educational programs and qualification of manpower; their priority are the cities where their business units are located. Their associates are offered incentive programs along with a private sports club where they are allowed to take their families as well as several other benefits.

Today GM Brasil is the second largest operation of General Motors outside the US and consolidated as one of the five global development centers of vehicles in the company. This is because they are able to perform all stages of creating a vehicle, from design to validation and to trading in a sustainable manner on all their processes, and yet they export technology to GM around the world.

Below we are going to approach the methodology used in the present study.

## **Methodological Procedures**

First a vast bibliographical study was performed with the objective of reviewing the data referring to the concepts that approach internationalization of companies, the policy of the Chinese government and the sustainable organizational behavior. We searched several sources of evidence such as: secondary data research, document analyses and interviews performed by means of a semi-structured questionnaire.

The Chinese company JAC Motors was chosen as the business unit object of this research due to the process of internationalization in Brazil in a non-conventional manner as the initiative came from a Brazilian group that holds approximately 90% of shares in Brazil.

Thus, the methodology used to collect such information was the case study by means of open interviews for more details with a public relation worker from group SHC that represents JAC Motors in Brazil. The interview performed in July 2012 was preceded by the development of a protocol of case study (YIN, 2005). In order to understand the company's organizational structure and the internationalization process were approached issues related to the interest of SHC group by the company JAC Motors as well as what drove the Chinese company JAC to get into the Brazilian market and the impacts of the organization and yet understand if the group intended to work with sustainable management in all of their processes and issues related to the allocation of resources, innovation and technology.

## **The entrance of the company JAC Motors in Brazil**

Jianghuai Automobile Co., Ltd. – later denominated JAC Motors – was founded in 1969 and is present in more than a hundred countries. In the beginning the manufacturing was exclusively for trucks, but overtime, the factory grew and modernized. Today, they have a diversified line of vehicles that meet the needs of several segments in the automobile market.

The process of internationalization of JAC Motors in Brazil started in 2010 where the SHC group, led by Sergio Habib, announced a partnership with the company to represent the Chinese brand in Brazil.

The process of internationalization was not conventional because it was an initiative from the Brazilian group SHC, the initiative was to bring to the country this Chinese automobile brand. We are talking of a project that was over BRL\$ 1 billion. As any other project, there are challenges. The SHC group the controller of the Chinese brand has acted over twenty years in the importation and distribution of the brand Citroen. After re-organizing the structure of the brand, Sérgio Habib decided to prospect in different parts of the world for new brands of automobile.

Thus, the SHC group analyzed four factors that determine the choice for JAC Motors as a partner to act together in the Brazilian market. The first was to notice that the company is in constant growth investing in new manufacturing processes focusing on the constant improvement of quality. Secondly, as they had a center of design in partnership with the studio Pininfarina in Turim, Italy; and a center of development of interior design in Tokio, Japan. And third, because JAC vehicles have both external and internal design that match the taste of Brazilian consumers, and most importantly, they have an excellent portfolio of vehicles development. And finally, the fact that JAC, according to the surveys made is one of the Chinese brands with excellent rates of quality.

JAC Motors brought to Brazil cars that have high performance engine and European technology. The engines are more resistant and offer more acceleration and a significant saving on fuel.

The process of internationalization of JAC Motors in Brazil takes place in two stages. In the first stage, the SHC group invested BRL\$ 350 million for the importation and distribution of vehicles. This process triggered the immediate opening of fifty authorized dealers, in addition to a modern center of part distribution which demanded investments of BRL\$ 200 million. For the launching of the brand and the start of operations we allocated BRL\$ 120 million.

The second stage will be the implementation of a plant in the city of Camaçari in the state of Bahia, forecasted for 2014. This project will demand investments of BRL\$ 900 million out of which BRL\$ 780 million are from the SHC group and BRL\$ 120 million from the headquarters of the group JAC Motors out of which 87% of domestic capital from the SHC group therefore having Brazilian control and management which will result into more jobs and income for the local community besides helping the economy. We should highlight that part of the financial drive of the SHC group will be made by investment agents, such as, the Brazilian Bank of Economic and Social Development (BNDES).

The choice of the city of Camaçari is because of three structural items: a) suppliers already installed and the culture of manpower spread in the region; b) logistics advantages: roads and harbors with the perspective of growth; c) proximity to points of consumers, for instance, the Brazilian Northeast region that has been showing a strong potential of economic growth.

The plant in Brazil will rely on a center of development for new technologies; center of style and design; control labs for pollutants emission; test track and center of professional development.

Currently, the SHC group has 89 authorized dealers in Brazil out of which 50 are from JAC, this figures should grow to 200 in 2014 with the implementation of the plant and the other brands.

Therefore we understand that the creation of a factory in the state of Bahia will consolidate the process of internationalization of the brand JAC Motors in Brazil.

### **The Institute SHC, a group the company in Brazil**

JAC Motors in Brazil invests in social responsibility by means of the SHC Group which is the company that brought JAC to Brazil, so the social initiative described below are not part of the business strategy of the company at an international level, but only for the group in Brazil.

The SHC Institute which was idealized and established in 2008 by entrepreneur Sérgio Habib has a long history of support to communities in the south of the state of Bahia. Located in Trancoso, the Institute is involved with a series of social projects.

The Institute works the education of the population in Trancoso in the state of Bahia. In total, 1,8 thousand children and teenagers are full time assisted in four school units. Besides that, there is a project to nourish kids which helps in complementing the food served at the schools; the project for improvement that contributes with infrastructure works and improvements at the schools, police posts, medical posts etc; the project clean beaches that helps in the maintenance of trash bins that are ecological friendly at the beaches besides helping with garbage collecting. In addition to the educational centers kept by the institute in partnership with local city halls where children have several activities such as, science lab, art room, room with projector, libraries, theater, dance studio, gymnasium, courts for sports, musical starter, choir, string orchestra, support for rural area schools, medical and dental service for the population. The main mission is to form and educate new citizens in Trancoso teaching citizenship and respect to others.

### **Perception of JAC Motors in the interview**

Some perceptions were highlighted in the dialog between the representative of JAC Motors in Brazil and an employee from SHC group.

The people interviewed inform that the executives from JAC and the SHC group understand that the Brazilian consumer likes innovation however they are very conservative yet regarding some preferences in terms of car and accessories. They stated that “a Chinese company has always been perceived as bad quality by Brazilians so how would this be in terms of cars”?

An important internal procedure from Chinese brand JAC Motors to get the new Brazilian market is the company’s strong concerning with design, technology and quality as well as “the value of service and reception of the customer”, according to the people interviewed. So it is necessary to create organizational conditions to meet this requirement.

What drove JAC to get into the Brazilian market besides the potential of a developing country, it was the character and leadership of Sergio Habib to lead the SHC group and successfully bring the brand Citroën into the Brazilian. The SHC group chose JAC due to the leadership in the manufacturing of light vehicles and the first exportations to China. In addition to JAC being present in over a hundred countries and having a research and development center. The people interviewed also stated that the employees felt proud of working for the company.

Another point in the interview was regarding the aspects related to the organizational behavior in the SHC group, after all those are the ones responsible for the management of the company JAC in Brazil. The people interviewed stated that the company invests a lot in incentive campaigns with awards focusing on driving associates to reach their targets. There is a strong sales strategy focusing on profits; yearly 25% of employees are replaced in case they do not meet the minimum profile set for efficiency.

The hiring of personnel was then made by the president who personally selected according to his own profile that was bold and able to have fantastic sales, so it is possible to believe that he used his emotional intelligence to select them. Later when the volume of activities increased, this task was delegated to employees. We noticed that what matters is the capacity of learning that the applicants have, therefore, prior experience has a proper but not fundamental value. The rationale converges to the high investments in training and *workshops* that the company offers their employees so “they commit more”, states the those interviewed. Sergio has his desk strategically located at a place in the company close to the employees focusing on the dialog between them.

The company does not have a stated mission, vision and values that according to the people interviewed it is part of the strategy of the company. There is not SHC group own site, but a JAC Motors site; this is also for strategic reasons.

The people interviewed said that the company has social-environmental practices through the SHC Institute, however there are plans for sustainable management on all their processes.

Regarding the structure, we can highlight the value of its own processes not accepting outsources. They believe that when the process is owned there is more cultural loyalty.

## **Final Consideration**

After analysis over the concept of internationalization applied to the Chinese automaker JAC Motors in Brazil as well as the understanding of the organizational behavior at the SHC group which brought and has controlled the operations in Brazil since 2010, we can infer the following considerations.

Among the theories of internationalization, it seems to us that the theory conceived by Uppsala University is the one that best reflects the process performed by JAC Motors keeping in sight for the Chinese company: i) the process may take place gradually and slowly focusing on knowledge and experience with the local environment; ii) the process may increase the trust for investment in resources in the country and slowly achieve the process of internationalization as learning over local evolves providing decisions to be made in the country with strategic foundation; iii) choice of starting their activities via exportation as well as the cession of the brand and technology transference and this process is made by JAC in Brazil.

What is highlighted in this process of internationalization is the significant financial allocation provisioned by the SHC group. Approximately 90% of the capital invested is from the Brazilian group that is the major manager of the operations in Brazil. This process may be analyzed in two distinct stages: first, with investment of approximately three hundred million Brazilian reais that were designed to the business stage and the settling of the brand in the Brazilian market, and the second forecasts the implementation of the automaker in the city of Camaçari, in the state of Bahia, and the investment is forecasted to be nine hundred million of Brazilian reais and that will in fact consolidate the process of internationalization of the brand in Brazil.

This process of JAC Motors in Brazil addresses the strategic ambitions both from the Brazilian side and from the Chinese side. On one hand, the SHC group broadens the range of products and expertise in the automotive industry, what provides more consolidation for the Brazilian group which is now more competitive in a highly competitive segment. On the other hand, the Chinese group meets the expectations for the governmental program “GoingGlobal”, which proposes to increase Chinese investments abroad. We should highlight that we have here a process that is difficult to manage as it is a product from China and it faces a certain rejection in the Brazilian market. Besides that, we highlight issues with contingent which are beyond the decision capability of SHC group executives, such as US dollar exchange rate, increase of taxes over industrialized goods.

From the point of view of sustainable organizational behavior we have observed a strong company’s concerning of encouraging employees to achieve the manufacturing targets, a favorable



environment to work, close and charismatic presence of the leader Sérgio Habib, open dialog and solid appearance in the market. And also the allocation of resources for social practices through the SHC Institute located in Trancoso in the state of Bahia. However, it is not evident in the research that a sustainable management is crossing all processes and business strategy of the company as exemplified below.

The company does not expose and therefore does not share in a visible manner their mission, vision and values. This is necessary for the process of the company's transparency before their target public. According to the authors mentioned in this study, this sharing is reflected in the strong organizational identity allowing the employees to have access over the positioning and future of the company they are part of. The management seems to us a little centralized on the leader what makes difficult the decision making and succession plan in the company. We also had the impression that by 2015 vehicle J5 will be launched in the world market as a hybrid, that is, a car that can be either electric or fuel driven.

Therefore we recommend the company to act strongly on sustainable processes for the manufacturing of automobiles as demonstrated in this article by GM do Brasil that has a technological center built in accordance with the concept of "Green Building", that focus to reduce the utilization of electric energy and natural resources in areas like stamping and painting. One of the main environmental principles adopted by GM is to reduce the generation of residues where all business units have composting practices, water recycling and reuse. Another initiative present in the painting of cars is the utilization of paints with higher solid content in order to increase yield and less solvent which results into less emission of organic compounds. GM also values the suppliers as business partners and hires them in accordance with their commitment with corporate responsibility. Upon these and other actions, the company diminished their costs resulting into more gains for the organization. However, one of the measures of sustainable management is the maintenance of jobs, and GM was called in by the Secretary of Treasury of the Ministry of Finance to provide explanations over their lay off plan at their plant in the city of São José dos Campos. The Brazilian federal government has a policy for tax reduction over industrialized products (called IPI in Brazil) for vehicles but on the other hand the government charges the companies the maintenance of jobs in the industry. "We give incentives both financial and taxes, and we want return on that" highlighted President of Brazil, Dilma Rousseff.

With these perceptions we can conclude that it is legitimate and significant for the country the entrance of foreign automakers, in the Brazilian territory, as for instance JAC Motors, main object of our study. Bringing to Brazil their projects for technological innovation focusing on the manufacturing of vehicles that are environmentally sustainable and at the same time on the integration of SHC group in the management of personnel that is compatible with the premises of sustainability, these are the major challenges to be faced and if addressed will be of higher significance for Brazil.

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# Solidarity economy as an alternative to social inclusion.

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## Abstract

The text addresses the solidarity economy as an alternative to the capitalist economy through the presentation of endeavors incubated by the Technological Incubator of Popular Cooperatives from Universidade Federal de Itajubá. The survey was conducted through a literature review, which the authors selected authors strengthen the issue that reducing the social and economic inequalities can be achieved through this new economy, based on self-management and collaboration, reinforced by several solidarity networks.

**Keywords** solidarity economy, solidarity endeavors, popular incubators.

## 1. Introduction

The capitalist economy is going through the 21<sup>st</sup> century contributing negatively to the increase in environmental, social, economic and cultural impacts, massifying people, disrespecting the diversity of each region, without considering local climates, cultures and knowledge.

The encouragement to exaggerate, unconscious consumption by some media instruments has contributed to the obsolescence programmed by companies, turning the individual hostage to products, services, unnecessary values for a good, healthy life.

Nations have the GDP – gross domestic product as their development indicator; however, there are several signs that the o GNH –gross national happiness index should be the most adequate indicator on the development of a nation, as it occurs in Bhutan.

Several experts have demonstrated that mankind is facing an unmotivating scenario, considering the dilemmas of global warming, extinction of original forests, reduction in sea life diversity, loss of agricultural soil, and depletion of critical natural resources.

We have one billion people starving, from which 180 million are children, from which 10 to 11 million die of malnourishment or lack of access to something as common as clean water. This means 30,000 children, or ten Twin Towers, die every day in the silence of poverty; they do not represent such a spectacle for the media. 25 million people have died of AIDS while we debate the value of patents. 2 billion tons of grains, or 800 grams per person per day are produced in the world, not to mention other foods. If we distribute the 63 trillion dollars of the worldwide GDP among the Earth's 7 billion people, the result will be 5,400 reais per month per family of four. Everyone could live in peace and dignity with what is produced. There are 737 global corporate groups, 75% of them for financial intermediation, controlling 80% of the world's corporate system, which explains the existence of billionaires. They aim at

maximizing profits, even if the planet goes into a generalized financial and production crisis. The challenge is simple – and we are destroying the planet to benefit a minority (DOWBOR, 2012).

Social movements are intensified, denouncing several of mankind's problems, but they fight through their own mechanisms and articulations to be heard, because the space given by the private initiative and the public power not always allows their manifestations.

The use of pesticides is increasing in a reckless manner, generating serious problems to the population that ignores their health damages.

Family farming in rural areas has tried to survive, but faces huge challenges concerning tax incentives and the difficulties of access to technologies that could support such endeavors. Thus, it is more difficult to participate in an extremely competitive market with resources in their own dynamics, through private initiative from major companies.

College education tends to adjust to market pressures and as time passes it adjusts its curricula, aligning them to the market needs, which tend to be increasingly technical, that is, searching for professionals who work in their areas of expertise to generate products and services that offer more and more gains and profitability to businessmen.

With so many problems faced by mankind in this century, this paper highlights the solidarity economy, via basic concepts, principles and some of their success practices with the respective challenges, in the sense of showing that a new world is possible with changes in attitudes, values and paradigms. For this purpose, a collaborative existence with a lot more responsibility and commitment with the planet's life is required.

## **2. Solidarity Economy**

Democracy is a relevant value defended in several levels in the social life, although its practice has been frail, especially when speaking on the economy (Tygel, 2011).

It can be seen models still with little participation from the population remain in force in several contexts and, thus live with inequalities and, thus, a wide economic and social gap among people.

The capitalist system exists in several countries, such as Brazil, but coexists with another economy based on its own principles in the sense of reducing social and economic inequalities. In this context, Tygel (2011) provides that in Brazil, set up a Solidarity Economy in three different dimensions:

- Economically, it is a way of executing the economic activity of production, offer of services, commercialization, finances or consumption based on democracy and cooperation, which we call self-management: in other words, in Solidarity Economy, there are no bosses or employees, because all members of the endeavor (association, cooperative or group) are workers and owners at the same time.
- Culturally, it is also a way to be in the world and consume (at home, in events or at work) local, healthy products from Solidarity Economy that do not affect the environment, have no genetically modified organisms nor benefit large corporations. In this sense, also symbolic and related to values, we are talking about changing the paradigm from competition to cooperation and collective, free, shared intelligence.
- Politically, it is a social movement that fights for change in the society, for a different way of developing, based not on major corporations or large estates, with their owners and shareholders, but on

development for people and built by the population upon values of solidarity, democracy, cooperation, environment preservation and human rights.

The fight for a fair world in the Solidarity Economy occurs through collective production, commercialization and consumption initiatives, where self-management, collaboration and participative management happen in the everyday survival of its members.

The way how this economy is conducted and aims at support is via production, commercialization and consumption chains and networks between solidarity economy endeavors and these consumers (Tygel, 2011). Thus, concentrated economic resources from the capitalist system are targeted to a networked system that does not concentrate capital and power.

In the Solidarity Economy, workers operate as an organized unit, valuing cooperation, from self-managed production units or small producers who get together to buy and sell as a group, to different methods of family farming, fair trade networks, company incubators, exchange and microcredit clubs, among many other experiences that have a fairer, more solidary and sustainable way of generating work and income in common (Santos et al, 2012).

Next, the authors Singer and Souza (2000, p.13) present a systematization to differentiate the principles of social economy in relation to the traditional economic model:

- a) collective ownership of production ways by people that use them to produce;
- b) democratic company management by direct participation or proxy, depending on the number of cooperative members;
- c) net revenue sharing among cooperative members, according to decision made in assembly;
- d) forwarding of annual excess (leftovers), according to criteria agreed upon by everyone;
- e) the basic capital share from every cooperative member is not paid;
- f) additional sums loaned to the cooperative offer the smaller interest rate in the market.

In the capitalist model, the overly valued competition increases inequality and contributes for the elite to be increasingly successful and distant from the large mass of poor people. Collaboration and the search for common good coexist with competition in this scenario; however, the existing problem is related to the level of intensity in the competition, which generates the exclusion of the ones who failed or are little prone to market impositions. Singer (2010) states that, with the challenges the solidarity economy faces, the solidary exchange and generation of complementary production chains have proven to be promising alternatives to the strengthening and viability of this new solidarity economy. Several authors feature on their research and practices that, in order to become stronger, solidarity endeavors need to be networked so that social-economic changes occur widely. Thus, such solidarity networks need the integration of several players in order to create a sustainable development process, with such players being governments, NGOs, society, schools and universities, incubators and research centers (SINGER, 2010).

For the Solidarity Economy to change from a remedy to capitalism evils to its competitor, it will have to achieve efficiency levels in the production and distribution of goods that are comparable to the ones in the capitalist economy and other production methods (SINGER, 2002).

Another interesting aspect considered in solidarity endeavors is that they escape from the utilitarian character so commonly found in work relations in the capitalist universe, being closer, in many cases, to actual families, with bonds built, companionship generated and sustained in proximity relationships that go beyond the production nature. Gains in the solidarity economy go beyond the economic ones – they bring autonomy, empowering, higher self-esteem, valuation of the social condition people live in, integrating individuals to the society.

Facing this fact, it is worth highlighting that, in order to measure the results from solidarity endeavors, we need to consider and include all these factors in the creation of indicators, because the return periods will be naturally different from the ones considered in traditional models from the capitalist economy. It is also worth highlighting that it is common to retrieve highly interesting social-cultural wealth from member communities and endeavors, because respect to local, regional and family knowledge is also among the solidarity economy principles.

Santos (2002) recalls the need for us to find new links in the production models. He believes that the relations in conventional capitalist model are impoverished in the face of competitive relationships required by the current market, because individualism prevails. Santos (2002, p. 64) highlights the main points in support the logic of a new production system and sociability:

- a) the importance of ties beyond the economic one;
- b) the success of production alternatives depends on the insertion in collaboration, mutual support networks (unions, NGOs, etc.)
- c) fights for alternative production shall be boosted in and out of the State;
- d) the production alternatives shall not be fixed solely in local scale, but be articulated in a wider scale, pulling away from isolation;
- e) the radicalization of participative democracy and of economic democracy are two sides of the same coin;
- f) there is a strong connection between the fights for alternative production and the ones against the patriarchal society. It is not a fight only in the economic plan, but also of gender, race and emancipation;
- g) alternative methods of knowledge are alternative sources of production; we learn from different ones;
- h) the criteria to analyze the success or failure of economic alternatives shall be gradual and inclusive and go well beyond economic reductionism;
- i) the production alternatives shall be in synergy with alternatives from other economy and society spheres, such as fair trade, Tobin tax, democratization of the World Bank and the IMF, universal minimum income proposals, compliance with ethical rules by foreign investors in southern countries, open immigration.

He also defends that, in order to make concrete a fair, sustainable global development, first it will be necessary to act and think locally, without giving up to possible global articulations. The work in collaborative network, by conjugating different local experiences, may produce one or several global alternatives, and new methods of production and social coexistence, less authoritarian and definitive, may arise in multi-experimentalism and get closer to the political sphere, aiming at a change in the structural foundations the entire dominating social-economic system is based on.



Global, sustainable and fair development can occur if local development occurs first, respecting local and regional knowledge, differences and diversities, in a constant, collective construction of coexistence and of solidarity economy.

In this prism, it emphasizes the role of technology incubators for popular cooperatives, initiatives that have happened within the solidarity economy.

### **3. Technological Incubators of Popular Cooperatives: INTECOOP/UNIFEI.**

Another component of the solidarity economy in Brazil is comprised of cooperatives and associated production groups, incubated by university entities, which name themselves Technological Incubators of Popular Cooperatives (ITCPS). [...] Since 1999, ITCPS have established a network that gathers periodically to exchange experiences, enhance the incubation methodology, and stand in the national movement of solidarity economy (SINGER, 2002, p.123).

The Technological Incubator of Popular Cooperatives from Universidade Federal de Itajubá (INTECOOP/UNIFEI) started its operations in January 2007, as a college extension program related to the Pro-Rectorry of Culture and College Extension (PRCEU). The incubator was implemented with resources from the National Program of Incubators of Popular Cooperatives (PRONINC). After 2003, PRONINC was financed by Fundação Banco do Brasil, by Financeira de Estudos e Projetos (FINEP), in partnership with the National Department of Solidarity Economy (SENAES), from the Ministry of Labor and Employment.

Thus, for Coutinho et al. (2011), the mission of Intecoop / Unifei, which is: “mobilize popular groups through collective work, encouragement to self-management and technology transfer, as a way to promote citizenship according to the principles of Solidarity Economy. As with the groups, one can say that the incubator is still maturing, because so far no group has been removed from the incubator.”

It is noticed that all the work of incubation of enterprises conducted by popular Intecoop / UNIFEI, follows the action research, which according to Pereira (2007) means involving researchers and participants representative of the situation in a cooperative and participatory.

The incubation methodology varies from group to group respecting the contexts presented. Coutinho et al. (2011) state that “likewise, a single group can be in several incubation phases at the same time, because the variables that indicate the conclusion of incubation phases not always are excluding.” For the processes of incubation in Intecoop / Unifei, we found the following stages in the development of the projects:

1. Articulation and mobilization of the society;
2. Identification of the group's profile;
3. Pre-incubation: basic notions of cooperative principles until the formalization;
4. Incubation: follow-up and assessment of the group's self-management;
5. De-incubation: emancipation of the group, for being considered able to work in an independent, formal and sustainable manner.

Currently, INTECOOP/UNIFEI assists four popular groups, each one with its peculiarities and in a different phase of the incubation process: Associação dos Catadores Itajubenses de Materiais Recicláveis (ACIMAR), Associação Artes da Terra (AAT), Associação Nutra|Saúde, and Associação de Pequenos Produtores Rurais de Itajubá e Região (APRIR). These groups include people directly benefited by work and income generation, not to mention their families, who in many cases depend economically on these members/associates. Resources to support the incubator, as well as the groups incubated, are complemented by public letters, such as PROEXT (MEC), CAPES (MEC) and FUNASA (MS).

Below, present a table and a brief summary on the groups currently incubated by INTECOOP/UNIFEI (2012).

Name	Purpose	Number of members	Period of incubation	Phase of incubation	Note
Acimar	Collection of recyclable materials	20	05/2007 - present	Incubation	Weekly meetings. Partnership with PMI (Itajubá City Government)
Nutra Saúde	Nutritional education and healthy eating	9	03/2008 – present	Incubation	Partnership with PMI
APRIR	Family farming	28	11/2010 – present	Incubation	First sale for school meals in the city of Itajubá already made. Partnerships with PMI, CEASA and EMATER
Associação Artes da Terra	Artisan crafts	14	04/2011 - present	Pre-incubation	Bimonthly meetings. Partnership with PMI

**Table 1: Description of groups currently assisted by INTECOOP/UNIFEI.**  
**Fonte: INTECOOP/UNIFEI (2012).**

### 3.1. Association Of Recyclable Materials Collectors Itajubenses (Acimar)

ACIMAR is comprised of a group of recyclable material collectors who worked in the former landfill in Itajubá. Today, through the association, the collectors are able to generate jobs and income and ensure – although still poorly – the support to their families. ACIMAR is an important player in the promotion of responsible management of recyclable residues and urban sustainability. Currently, the collectors have a shed for triage and separation of materials, a truck, as well as a few mandatory equipment items, such as hydraulic press, scale and flexible bags; this area and equipment are granted by PMI or by the service concessionaire. In addition to offering accounting and administrative support, INTECOOP/UNIFEI periodically conducts workshops on “social-citizen” education.

Actions that improve the selective collection route in the city, as well as the expansion of the area served by the association, are also expected.

### **3.2 Nurse Association | Health**

Nurse Association | Health is focused on promoting the population's health through Nutritional Education and Sustainable Eating. The group develops actions that may improve the quality of life for people in social-economic vulnerability position. Nutra|Saúde works in qualification and generation of work and income, with topics related to eating and nutrition. In advanced incubation phase, INTECOOP/UNIFEI works with the group in order to allow its sustainability.

### **3.3 Association of Small Farmers and Itajubá Region (APRIR)**

From the legal statement that declared, in 2009, that at least 30% of the school meals should come from family farming, PMI, through the Department of Agriculture, looked for support from INTECOOP/UNIFEI, to help establish a group of family farmers. The goal is to strengthen the work from these rural family producers. In addition to offering administrative support, the incubator shall work in the group's formation and integration, identification of new economic potentials, elaboration of business and marketing plans, as well as education in management and legal aspects.

### **3.4 Arts Association of the Earth**

Despite the fact that the association is already formally constituted, its approximation with INTECOOP/UNIFEI is justified by the lack of financial sustainability in the group. The intention is to emphasize the qualifications in financial and accounting advising to the group, as well as support to the expansion of the association's consumer market and the social-environmental commitment of the products sold. The association's meetings – which were held only during crisis and irregularly before the pre-incubation process – became periodical, in order to allow the group to strengthen its planning capacity and pursuit of effective solutions to its needs.

As positive points of the current structure, it is worth mentioning: i) the availability of physical space for the INTECOOP/UNIFEI facilities in the Itajubá campus; ii) the participation from university workers in the INTECOOP/UNIFEI team, which tends to allow built-up institutional knowledge and continuity in the incubation process; iii) interdisciplinary team, competent and committed with the development of the region, in its broader sense; and iv) permanent team qualification in the elaboration of academic projects and products, which has allowed relative success in the execution of such activities. A few of the negative factors were: i) low level of knowledge – and, therefore, of valuation by the academic community of the work developed by the incubator; ii) little participation and involvement from the academic community, a factor that, allied with the low resonance of the work developed, seems to be explained by the institution's predominantly technological nature; iii) lack of institutionalization of the incubator in the institution's organizational chart – as well as for extension in general, which results in budget difficulties; iv) lack of continuity in group advising activities, since most of the resources raised has no multiannual application; and iv) as it happens in several popular groups, the turnover of team members is very high, a factor identified as harmful for the work progress, because it makes difficult to retain institutional knowledge and memories, as well as ones concerning the activities developed with the groups.

Since its foundation, in 2007, except for the current team, nine technicians and 38 students, among scholars, interns and volunteers, have gone through the incubator. Additionally, the excessive bureaucracy, which sometimes deviate the focus from the incubator's intended activities, must be mentioned.

A major challenge to any extension activity is how to measure the results from your work, due to its subjectivity. After all, it is difficult to find numerical indicators capable of reflecting the greatness of recovering the self-esteem and citizenship of a garbage collector, for example. On the other hand, in numbers, INTECOOP/UNIFEI has conducted a few projects awarded through public edicts, its main source of financing. In 2010, INTECOOP/UNIFEI executed four projects that had been approved the previous year by the Edict ProExt/MEC 2009. In 2011, a little over R\$ 495,000.00 will be invested, to be applied in direct benefit of the incubated groups and also of public schools in the city and region. Such resources come from the Edict ProExt/MEC 2010, DEB/CAPES and FUNASA/MS).

The examples presented were taken from materials provided by of INTECOOPS/UNIFEI, especially the article presented on the 5th Brazilian College Extension Congress, in Porto Alegre, November 2011, by members of the incubator, as well as from the institution's website: <http://www.unifei.edu.br/intecoop/a-intecoop>.

Thus, one sees the major challenges faced by the incubator as well as advances of its incubated enterprises. Thus, it was found that INTECOOP / UNIFEI mobilizes people, institutions and partnerships, as well as brings opportunities to everyone involved, from incubated groups that find improvements in job opportunities and generation of income, to experienced, qualified professors, young college students and experts who work together, connected by ideology, principles and by the development of a new economy, where values and principles can be taken to their personal lives. This incubator from UNIFEI is maturing, prioritizes harmonic relationships that allow improvement in the quality of life of people (Coutinho et al, 2011).

Despite the challenges to be faced, we understand that universities cannot hide from major economic, social, political, cultural and environmental dilemmas so evident in our times.

## **Final Remarks**

This paper presented the challenges in the contemporary work concerning un-sustainability issues. It highlighted the solidarity economy as an alternative to reduce exclusions and introduced solidary endeavors from the technological incubator of popular cooperatives from Universidade Federal de Itajubá (UNIFEI-MG).

Despite the constant challenges the solidarity economy faces, it has conquered adepts, developed in a more organized manner, and expanded its presence in universities, via technological incubators of popular cooperatives (ITCPs), via research and scientific publications.

It was noted the benefits that this new economy has already generated groups previously thought to be excluded and marginalized. For the purpose of this study was to disseminate INTECCOP / UNIFEI to strengthen the role of social economy as an alternative to the capitalist economy, the actions, principles and management model seeks to reduce economic and social differences, favoring the generation of income and thus reduced social exclusion and marginalization of large groups.

Thus, solidarity economy has presented itself as a more sustainable economy than the capitalist, and could be better explored in research environments, better disseminated by the media, and receive support from different segments of the society.

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# Territorial Development – Managing for Sustainability in Brazil

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**Abstract:** In this study, emphasis will be given to the challenge of the organizational management process within a development model that considers the territorial possibilities and necessities as a basis for the process of sustainable, endogenous development. The territorial unit considered in the study is the municipality, highlighting the existing possibility in Brazil of implanting a model of participatory management on taking into account the large number of small municipalities existing in the Country. The problematic of large cities is also analyzed, recognizing, however, the greater difficulty of articulation among the representative players of society, based on the exogenous forces engaging within these regions. In order to study the management process, the contexts that support the concept of sustainable development and the form of organizing the economic activities will be defined. In the discussion of management properly stated, emphasis will be given to administrative decentralization and to articulation, to planning process and to dissemination of information.

**Key words:** territorial management; articulation; planning; sustainability.

## 1. Territorial development

The study on the possibility of territorial development being considered, as an alternative to the centralized model of public management for countries like Brazil, seems pertinent based on the contrasts encountered within this territory such as, rich industrial development centers neighboring shanty towns, a powerful agro-industry neighboring or occupying deforested areas, a large area of forests with great wealth in terms of biodiversity to be scientifically explored and physically preserved, which demonstrates the diversified scenario of potentialities and needs to be identified and managed.

Brazil embodies an area of approximately 8.5 million km<sup>2</sup>, which can be divided into six different biomes, according to IBGE (Brazilian Institute of Geography and Statistics) publication:

Brazilian Continental Biomes	Approximate Area (Km <sup>2</sup> )	Area/ Total Brazil
AMAZÔNIA Biome	4,196,943	49.29%
CERRADO Biome	2,036,448	23.92%
MATA ATLANTICA Biome	1,110,182	13.04%
CAATINGA Biome	844,453	9.92%
PAMPA Biome	176,496	2.07%
PANTANAL Biome	150,355	1.76%
Total Area - BRAZIL	8,514,877	

Source:

[http://www.ibge.gov.br/home/presidencia/noticia/noticia\\_visualiza.php?id\\_noticia-169](http://www.ibge.gov.br/home/presidencia/noticia/noticia_visualiza.php?id_noticia-169)

This space is occupied by a population of more than 190 million habitants, with an urban concentration in the order of 85% of the population. This territory is divided into 5,565

municipalities, of which 4,957 municipalities have less than 50,000 habitants (IBGE, Census 2010).

The high rate of Brazilian urbanization highlighted in the last four decades of the past century, generated a full order of imbalance in these cities, given that they were not prepared for a migratory movement of that order. The urban population in the 1960 Census was in the order of 45% of the total population. In a certain form, the same phenomenon that would occur in Europe during the 19th century, as a result of the industrialization process, has occurred in Brazil, and is aggravated with the installation of the agro-industry and the use of land as a reserve account.

Within this context of deep, rapid changes and of diverse situations, considering the possibility of analyzing the proposals inserted within the discussions on territorial development and the respective management process becomes particularly interesting, as a form of harmonizing the national needs of (economic, social and environmental) development with local particularities.

## **2. Methodological Approach**

From a methodological point of view this study can be classified as follows:

\*As to the approach, it is qualitative, for being concerned with aspects of reality that cannot be quantified, as well as centered on understanding and explaining the dynamics of social relationships.

\*As to the nature, it addresses applied research, for aiming to generate knowledge for practical application, driven at the solution of specific problems.

\*As to the objectives, it addresses exploratory research, for having the objective of affording greater familiarity with the problem, aimed at making the problem more explicit or building hypotheses (GERHARDT, 2009).

## **3. The contexts of sustainable development**

Usually a definition of sustainable development contemplates three contexts: economic, social and environmental.

Another two aspects are equally important and, when inserted into this definition, expand the likelihood of success within the management process for sustainability: territorial and political (SACHS, 2008).

The territorial factor lays out the space where the diagnosis of the situation must be conducted, making the understanding of the possibilities and the needs more practical.

The political factor contributes with the necessary institutional apparatus that allows the local players – Government, business and civil society – to be able to engage in an organized manner, thus maintaining each player's independence and freedom of speech, while generating a favorable environment for the articulation process.

Another aspect that must be considered in a complex environment, as previously pointed out, is the cultural factor. In a country like Brazil, cultural differences must be contemplated upon studying territorial possibilities. Amazon communities present great cultural and environmental differences when compared with communities in the south of the country, both in terms of the biome and the colonizing history, which influence local culture and must be considered and respected in a management process.

Therefore, these six contexts must be present within a process seeking the articulation of the local forces, aimed at organizing public, business and civil actions aimed at the well-being of the community as a whole.

## **4. The organization of economic activities**

Understanding how the economy is organized is important to improve the process of territorial management. Traditionally, economic activities are divided into primary sectors, represented by agriculture, secondary sectors, embodying industry, and tertiary sectors or services. Dowbor, in *A Reprodução Social vol 2*, offers us a broader vision of this division by proposing that the following form of organization be considered for any study that is made of economic processes:

- \*Productive activities – agriculture and husbandry, logging, fishing, mining, construction and transformation industry;

- \*Economic infra-structures – transports, telecommunications, energy, water and sanitation;

- \*Commercial and financial intermediation;

- \*Social services – health, education, culture, information, entertainment, urbanism, housing, social protection networks, tourism, sports, justice and security (DOWBOR, 2001b, p. 9).

This division, on emphasizing infra-structure and social services, becomes more interesting for the study and the definition of the territorial potentialities, as well as for the discussion of action priorities in the management process that will be discussed further on.

## **5. Territorial governance or management**

On considering the Brazilian territorial division of 5565 municipalities, where 89% of these municipalities have less than 50,000 inhabitants, 85% of the population is concentrated in urban areas and there are diverse potentialities and needs based on the actual territorial extension, these studies are focused on municipal units.

The territory as a place where people live and exercise their rights and duties is, in the definition of geographers, the contiguous space where life, production and culture are organized. This space, in the organization of modern civilization is identified in the *city* (SANTOS, 2008).

Problems such as the eradication of poverty and the preservation of the natural environment, despite being the focus of international discussions, as occurred in the United Nations Conference on Sustainable Development, RIO+20, could see relative advances in being addressed, if they are analyzed on a distributed basis, in compliance with local realities and needs.

This argument takes into consideration that any territory does not exist on an isolated basis and should be attent to global movements, whether they be economic, social or environmental. Thinking globally, acting locally means analyzing territorial particularities aimed at development through their internal or endogenous forces.

## **6. Administrative decentralization and the articulation process**

Within a democratic system, a process of administrative decentralization must hold the basic principles of changing the model of representative democracy to participatory democracy, decentralizing and debureaucratizing the distribution of public funds, and reducing the number of instances until they reach the local administrative units (DOWBOR, 2008).

A central Government is expected to provide the availability of basic infra-structures such as energy, roads, railroads, telecommunications, facilitated public financing, mainly for micro, small and medium-size companies, monetary, oversight and taxation policy to afford an adequate distribution of corresponding responsibilities and financial resources (DOWBOR, 2001b, 2008).



Local public authority is expected to provide the allocation of resources based on an action plan, which has been widely discussed with all the other players of society – businesses and organized civil societies.

This process depends on the understanding that participation enables the alignment of expectations, the recognition of local capacities and needs, a definition of the priorities and control in executing the developed plans. The articulation of these agents is the great challenge of local development and at times its greatest weakness (VAZQUEZ BARQUERO, 2001).

From an institutional point of view, the Federal Constitution of 1988 guarantees the formation of City Councils to allow the participation of citizens in discussions on public policies for social areas. This may be a starting point for popular engagement in defining the priorities of municipal investments, nevertheless, the articulation process must be expanded and the participation of non-governmental organizations, by being structured, can have fundamental significance in thoroughly debating this discussion. Civil society organizations (CSO or NGO) have held an important role in reducing the social problems instilled by strong, disordered urbanization engaged in areas where the public sector and private business have shown to be inefficient and uninterested respectively. The proximity with local reality, the awareness of society's most urgent demands and the fact of being relatively well structured in functioning as networks of information and of the dissemination of knowledge, make these organizations important agents that assist in the formulation of public policies and actions within the territory.

Businessmen must also be stimulated to participate, since the teaching structure contributes in preparing the workforce. The existence of financing, with appropriate rates, is of fundamental importance for modernizing and expanding production, in addition to other factors of interest, such as infra-structure, health and other social services, which contribute towards the territory's business competitiveness.

Equally important is the political forthcomingness of local governing officials, which is fundamental in this process. They are in charge of orchestrating this entire movement, in order to give coherence and realism to these actions, given the existing budgetary limitations (DOWBOR, 2001c).

Dowbor further emphasizes that:

“Reinforcing the local capacity of government is necessary, but not enough, for minimally coherent public management. The required change involves a profound alteration in the administrative political culture. The difference, in our vision, is that a participatory society organized around its own interests – and local interest is a powerful organizer of citizenship – becomes a strong stabilizer of the central government itself and of the processes of international regulation, which we need” (DOWBOR, 2001c, p.30).

Reinforcing the thought that a participatory democracy does not substitute the responsibilities of the elected governing officials, Paul Singer points out that:

“A participatory democracy does not oppose formal representative democracy and does not even intend to substitute it. Participatory democracy incorporates representative democracy, complementing it with direct democracy – consulting, plenary assemblies – whenever possible and multiplying specific representative instances, in which a full diversity of interests and ideologies may be presented, debated and negotiated or, eventually, pre-negotiated, since final decisions must be made in more generally elected instances” (SINGER, 1998, p.125).

## **7. The challenge of planning**

The transition from a central model of decision-making to a participatory model, in search of sustainable development, contemplates the need of knowing how to manage crises, since a simple alteration of the model, opting for the mobilization of those resources within the territory, through the modernization of the productive processes and the rendering of services, may generate imbalances in the allocation of human resources, causing an effect opposite of that desired, which is an expansion of the job opportunities and the generation of income (SACHS, 2008).

This transition process requires the application of a model of progressive change, which must make good use of the technological context existing within the territory, working on organizational improvements through business training and structural changes in the productive process, introducing innovations to the measure that employment is expanded. This model of endogenous development attends the objective of productive efficiency, required to increase competitiveness, giving emphasis to social dimension (VAZQUEZ BARQUERO, 2001).

This process is denominated by Sachs as the use of “*adequate technologies*”, which harmonizes the best use of installed capacity in the local production sector with maintenance and, whenever possible, an extension of the work and income offered. Particular attention must be given to those products denominated “*unmarketable*”, which are products within the territory that do not depend on imported resources, in addition to not suffering strong pressure from outside competition. Examples of perishable products are home building, local infrastructure and services that allocate more of the workforce (SACHS, 2008).

Stimulus for family agriculture must also be considered, with the creation of green belts within municipalities, providing the local populations with produce at lower prices, given a cost reduction in transport and storage, and if adequately orientated, offer products of superior quality. Orientation must be directed at eliminating the use of agrochemicals on planting products and economical forms of irrigation, thus contributing in the generation of work and income, safe nourishment and helping to preserve the natural environment (DOWBOR, 2008). The Social Technology Network offers a series of low cost models that allow for this type of production. Another example is the Bank of Brazil Foundation, which also presents experiences of social technologies already viably operationalized and offers textbooks orientating their implantation.

Dowbor restates the urban-rural relationship in the following way:

“Cities, on the other hand, have to be put back into the rural space where they belong. As such, it would be more accurate to speak of local space than of urban space. In the excitement of recent urbanization, a human being forgets to what point he is bound to the fields surrounding cities, and one essential element of urban development will be the reconstruction of urban-rural relations, no longer based on the fields, as in the classic vision of agrarian reform, but based on the city itself” (DOWBOR, 2001a , p.23).

Local business, particularly micro, small and medium companies (companies with as many as 49 employees were responsible for 39% of people employed in Brazil in 2009 – IBGE, General Business Registry), can be strengthened by several initiatives. Organizational restructuring requires an increase of administrative capacity, the productivity of innovation and the competitiveness of building a network where companies work on a complimentary basis and when they are competitive, by participating in collective purchasing and promoting their products in an organized manner, constantly seeking economies of scale (SACHS, 2008, ALBUQUERQUE LLORENS, 2001).

In Barquero’s vision, there is a “set of initiatives that incentivize the rise and expansion of immaterial factors and qualitative aspects in local development. Then those

measures will be included, which fall upon the qualification of human resources, technological and innovative know-how, technological disclosure, entrepreneurial capacity, information about organizations and companies and the culture of development that is embedded in the population” (VAZQUEZ BARQUERO, 2001, p. 202).

Along this line, it is worth underscoring the contribution that can be given by SEBRAE (Brazilian Small Business Support Service) in forming Local Productive Arrangements. The creation of a Local Development Agency, aimed at organizing needs and monitoring action plans, can also contribute towards the evolution of those immaterial and qualitative factors mentioned above.

The need of financing for local productive activities is not at all immaterial and is, without a doubt, a great challenge in the management process.

Recalling the Brazilian territorial division, 5565 municipalities, presents the challenge of knowing how to get financial resources to reach all these locations, with adequate costs, to foment the previously discussed productive activities. Private banks, when present, operate in a manner that is disconnected from local needs. Local savings are not reused within the actual territory. Interest rates disenable the process of modernizing local companies leaving them hardly competitive. The initiatives of small entrepreneurs become unfeasible and the business mortality rate can increase. There are a few positive experiences in forming municipal banks, credit unions and even the issue of a local currency and these may be a pathway to solving such a complex problem (DOWBOR, 2001b, 2008).

The existence of Development Agencies can also contribute towards the organization of these demands, by supporting local initiatives in the search of financing existing within governmental areas or even at BNDES (Brazilian Development Bank).

If duly organized productive activities sustainably contribute towards territorial development, social services can be used as leverage in the process of generating work and income on two fronts.

On first hand, areas such as education, health, transport, security, leisure, housing, infra-structure, sports and culture hold a strong allocation of the workforce as an essential characteristic. On the other hand, in order for quality services to exist, this contingent of the workforce requires specialized training, which leads to higher wage compensation.

Second of all, the perennality and the competitiveness of productive activities directly depend on the quality of social services offered to the population. Examples can be stated such as education, in training the workforce, health, in reducing absences at work, originating from sickness, transport, facilitating access to companies, security, sport, leisure and culture generating the increased satisfaction of the population and greater productivity at work. As a result, a virtual circle of development is created, with social inclusion and a consequent increase in feelings of belonging (DOWBOR, 2001c, 2008).

Articulating the whole of society in the diagnosis and enabling ways they can improve their quality of life can be a great facilitator in the discussion on environmental issues inherent to the productive processes, as well as in the creation of management processes for existing natural resources. Despite the need for this discussion to occur on a global basis, in UNO sponsored forums, the problems are originated locally. If the principals of environmental education, corporate social responsibility and natural environment preservation have been discussed in each municipality, the possibilities of global targets being met become more promising.

Vasquez Barquero underscores that the structuring of territorial development policies reinforces the ecological dimension, for these give more emphasis to qualitative than to quantitative aspects of development, and complements:

“the preservation of the natural environment is a source of opportunities in creating companies and jobs. The proposals of the last generation (of

policies) stimulate ecological agriculture – producing products that are increasingly demanded more at higher income levels -, feed urban and rural tourism – which attract travelers and tourists and help to conserve historical and cultural treasures and the natural environment -, generating research activities and the production of renewable energy and create activities for services and technical assistance, centered on the preservation of the natural environment” (VASQUEZ BARQUERO, 2001, p.243).

## **8. Organization of information – transparency within the process**

A participatory management process requires transparent organization and the availability of information on a level playing field. This information will be posted at two moments of the processes: firstly as form of obtaining a map of the municipality’s situation in all of its activities, orientating the definition of priorities and the planning of actions and secondly for accompanying the defined plans and the main indicators of results.

The set of information made available by central authorities, quite often, appears to be structured on an aggregated basis and is not transformed as useful information for action in local processes. Furthermore, results if an exclusive economic order do not attend the needs of information as a strategic tool for local planning (ALBUQUERQUE LLORENS, 2001).

The availability of information, with the revolution in information and communication technologies (ICT), has become much simpler and cheaper. The possibility of a municipality setting up its own telecommunications system at a relatively low cost will assist digital inclusion, placing an ordinary citizen in touch with the world, will contribute with local companies towards internet access at reduced prices, and will provide a modernization of the administrative machine. Setting up a database for the actual municipality does not require sophisticated tools and such disclosure complies with the democratization of information, essential in the process of articulation and of stimulating participation (DOWBOR, 2001c, 2008).

In Brazil, IBGE detains a great deal of information already organized by municipality, and other information that can be obtained from the Ministries. Furthermore, initiatives such as the ODM Portal – Municipal Accompaniment of Millennium Development Goals – are made available important indicators on all Brazilian municipalities.

In 2005/2006, the *Instituto Cidadania* developed a National Policy Project for Supporting Local Development introducing eight axis areas in formulating policies, divided as follows: financing and marketing; technology; institutional development; information; communication; education and training; work, employment and income; and environmental sustainability. This project presents a diagnosis on the situation of each axis area and offers proposals in forwarding solutions for problems encountered.

Interesting experiences may also be consulted such as those at *Rede Nossa São Paulo (Sao Paulo Network )* and at *Câmara do Grande ABC ( ABC Chamber )* which are structured on the axis areas and offer a series of development indicators. The *Instituto Pólis*, which gives great emphasis to local development, at its electronic address, offers a manual of Tips for City Actions, where very successful experiences, on several topics of interest to the local players and to the articulation process, may be located.

In light of the scenario exemplified above, it might be said that from an informational point of view, the Brazilian situation shows to be highly promising for the process of identifying needs. However, the importance of structuralization, the availability of information on action plans and their respective indicators must be emphasized.

## **9. Development of Large cities**

Large cities and, mainly, the metropolises present particularities that make their development process sustainably more challenging. The influence of metropolises has altered according to the diverse moments of Brazilian history from, at first, being responsible for commanding the territories and their surroundings, structuring social, political and economic organization according to the determinations of the central Government to, in changing with the process of globalization, primordially serve the hegemonic interests of large national and international organizations, which have come to command these territories with the support of the Government (SANTOS, 2008).

This phenomenon occurs throughout the world, transforming metropolises into the mega-knots of a giant global network, converging points for capital, specialized workforces, processes of innovation and power (CASTELLS, 1999). The power of these transnational organizations is presented in a study from the Swiss Federal Institute of Technology, which is analyzed by Dowbor in an article regarding the network of worldwide corporative power.:

“The Swiss Federal Technology Institute (ETH) of Zurich published the first map of the network of global corporate control, a contribution of first-rate importance. This basically shows that 737 groups control 80% of the universe of large transnational corporations, of which 40% is controlled by a hard core of 147 corporations that are almost all financial corporations” (DOWBOR, 2012).

These forces, studied by Milton Santos, are foreign to local reality and its needs, thus creating great disparities in terms of the distribution of benefits. Municipal investments are centered on services in their own interests, marginalizing everything that does not give them direct returns, causing dramatic situations in these large centers where local power has enormous difficulties in articulating and establishing policies that promote ample rearrangement and development, creating wealthy areas and shanty towns within the same physical environment. According to Milton Santos, “this is the great damnation of the contemporary metropolis” (SANTOS, 2008, p.73).

Data from the 2010 Census show the following reality in terms of large urban agglomerates:

\*Metropolitan Regions and Regions of Integrated Economic Development (RIDES) concentrate a population of around 90 million habitants.

\*When municipalities are classified by population size, 38 municipalities with more than 500,000 habitants are encountered, amounting to a total population of about 56 million habitants.

The vision of this population concentration serves to provide the dimension of those challenges inherent to managing these spaces. The logic of processes seeking sustainable development can be considered the same, however, the organization articulation and planning processes will require greater effort and creativity.

## **10. Final considerations**

Territorial development has been presented as one of the most promising alternative forms to the traditional model of public management in municipalities.

As observed, a process of local management is initiated by administrative decentralization, which leads this discussion to consider that all the other levels of – state and federal – government must provide a flow of resources to municipalities in proportion to the responsibly. Even without considering that this first phase amply, very successful, the next step is put emphasis on the articulation of the local players, Government, business and civil society, aimed at migrating from a representative democracy to a participatory model.

In this system of participatory management, the organization of demands within a planning process, discussing the existing capacities, the potential of developing new activities,

the natural resources, the situation of the natural environment, the business structure, in organizational and technological terms, the agricultural structure, the scenario of local infrastructures as well the situation of public services and the budgetary reality of that municipality, must generate action plans that will form a set of initiatives, understood to be priorities by local society as a whole, in search of local sustainable development.

As Dowbor points out, despite the need of participation from all agents, the orchestration of the process by local governments is of fundamental importance in order for all these interests to be harmonized with the real potentialities, capacities and interests within each municipality and for the process of effectively managing action plans to exist with the facilitated availability of information, thus stimulating the continuity and expansion of the participatory process. Vazquez Barquero warns that, in the process of participatory management, articulation becomes the main challenge and, at times, the greatest weakness, but also recalls that, upon attaining conditions that allow the process to progressively advance, territorial development, by privileging local resources and capacities, carries in itself a unique social dimension.

Finally, it's important to consider that there is a significant volume of information in Brazil, both in terms of structural data as well as accumulated experiences, available for local agents for the purpose of territorial sustainable development management.

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